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HAWTHORNE DANIEL
Editor



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A SMALL FIGURE OF BAKED CLAY FROM LIBERTAD, CHIAPAS, MEXICO

Each element is made separately and then joined to form a whole

(See "The Native Art of Middle America")

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XXVIII

NATURAL HISTORY

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NOVEMBER-DECEMBER, 1928



THE NATIVE ART OF MIDDLE AMERICA

The Development of American Art in Pre-Columbian Days—The Beauty
and Virility of Maya and Aztec Sculpture and Design

By GEORGE C. VAILLANT

Assistant Curator of Mexican Archaeology, American Museum

MIDDLE American art suggests to most of us mazy complications of form and line, further distorted by an elaborate symbolism. Rarely will a person admit the plastic and delineative arts of Middle America to a common ground of appreciation with the arts of Asia or Europe. This attitude of mind is caused largely by that complicated designs and by the grotesque divinities represented in this area. We forget the perfection of execution because of the difference between that æsthetic and ours. We fail to appreciate the fact that the ritualistic religion and the formalization of social life naturally are reflected in Middle American Art.

The customary introduction to the artistic forms of any nation is through examples that illustrate the point of view of its own æsthetic. In respect to Middle America, attention has been called to the sculpture of the Mexicans and Mayas, but the types and subjects are so foreign that they bewilder most people who have not a professional acquaintance with those civilizations. On the other hand, it is apparent, even to those who are not

attracted by their first contact with the plastic forms of Middle America, that there is something far from primitive about these artistic manifestations. Yet the casual observer, in an excursion through a museum hall where such examples are on view, will let his general impression turn him away from a closer examination of individual specimens that, step by step, would lead him into an appreciation of the art of these people.

The purpose of the accompanying photographs, which were taken by Mr. Irving Dutcher and Mr. H. S. Rice of the photography department at the American Museum, with the aid of Mr. Edward Burns, of the preparation department, is to lead the reader up to the more complicated examples of Middle American Art, by showing specimens, mainly of sculpture, that are not burdensome by reason of detail and that relate to the human side of life. For the most part the examples selected have never before been illustrated, and are to be found on exhibition in the Mexican Hall of the American Museum.



HEAD OF TRACHYTE, COPAN, HONDURAS
(*Lowland Maya*)

This is a splendid specimen of Maya art. The nose of the figure has been restored

Right.—Design taken from pottery stamp, Valley of Mexico

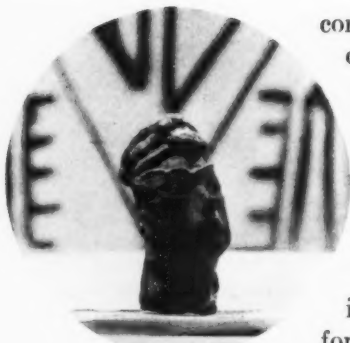




PORTRAIT MASK, DISTRICT OF TUXPAN,
 VERA CRUZ, MEXICO
 (*Highland Nahuatl*)

Note the difference between the racial type represented by this
 mask and the head from Copan on the opposite page

Left.—Design taken from pottery stamp, Valley of Mexico



CLAY FIGURINE OF A
WOMAN'S HEAD

From Azcapotzalco, Federal District, Mexico

The art of the peoples who inhabited the region between the Rio Grande in the north and the Isthmus of Panama in the south survives through their stone sculpture and pottery. Decay has removed from our knowledge almost all of the textile arts and carvings in wood. The residue shows us an art characterized by love of abstract form, by vitality, and by presentation within the boundaries of very definite rules. In the later and more civilized nations an extreme intellectualization obscures these basic principles. The elaborate system of government, largely by the priests, caused the artisans to construct temples with ornaments symbolic of elements of each nation's numerous gods, many of which were grotesquely represented. Ornament and the depiction of figures were reduced to an almost ritualistic

conventionalization. But against this background, especially in the folk-arts, sometimes in the highly formal religious art, there are glimpses of a human element that is engagingly vital. It is by this folk-art that we shall try to bridge the apparent gap between the aesthetics of the Old World and the New.

One of the principal phases of Middle American culture concerns the depiction of human beings. While it is doubtful if the specific portrait of any individual was ever attempted, there is a strong feeling for racial type, the inspiration for which may have come

from the observation of fellow tribesmen. In the earliest cultures of which we have any knowledge in Mexico, the people attained considerable skill in modeling figurines in clay (shown on this page). Stone seems not to have been employed by these people. Certainly the manipulation of clay brings out subtleties of contour and depictions of detail that could not have been achieved in a harder medium. The number of methods employed in pre-



Above—SEATED FIGURINE OF CLAY,
TETELPAN
Federal District, Mexico

Below—HEAD OF FIGURINE,
CONTRERAS

Federal District, Mexico. The heads on this page are representative of the earliest cultures found in the Valley of Mexico. Observe the attempts to reproduce expression and naturalism



sending the features shows an art in fresh development, unbound by adherence to convention. Above idealized form is the attempt to instil life by depicting the true contours of the nose, mouth, and eyes. Since these people were probably like those of the present population, who are generally fleshy and long-bodied, the figures are presented as such, without the attention to bony structure so common among the ancient Greeks. Through the evidence of these "Archaic" figures, we see that the early tendencies of Middle American plastic were toward naturalism and vitality.

Too little is known of Middle American archaeology to treat of its arts chronologically, nor is it our purpose to do so, but rather to indicate some of their aspects. The art in clay always was important. From the time of the beginnings made by the "Archaic" people in Mexico, increasing mastery of technique developed such perfections of expression as the singing figure from Puebla or the whistle from the



SMALL CLAY WHISTLE
Maya Culture
From the Usumacinta
River, southern Mexico



Above.—CLAY FIGURINE, MEDIUM SIZE
State of Jalisco, Mexico

Below.—MODEL MASK OF CLAY
FROM THE VALLEY OF
MEXICO



These specimens are of later date and of more finished workmanship than the preceding. Note the expression of despair on the figurine in the center

Usumacinta Valley, both on this page.

However, as is so often the case, clay remains a medium for the expression of the ideas of the common people. The laughing head from Vera Cruz (page 569) is really gay. The singing head from the same area, shown on page 568, might almost have been modeled from life. The bearded figure from Chiapas (page 562) was likened by a visitor to Rabelais' Panurge.

One might well ask why there are not more types of expression. Sentimentality is not a notable Indian characteristic. Neither is fear, nor among the ancient people of the New World is love or the idealization of feminine beauty emotionalized or stressed. The nobility of man and dignified silence, or, more rarely song and laughter, are expressed. In Western Mexico, the inhabitants modeled what



**BOWL OF BLACK
CLAY**

Chupicuaro, State of
Guanajuato, Mexico

The conception of true
form is dominant in
Middle America. Note
the remarkable har-
mony in the propor-
tions of this bowl. The
vessel is burnished by
rubbing with a stone
or the end of a stick



POTTERY FIGURINE OF MEDIUM SIZE

Probably from southern Vera Cruz, Mexico. It apparently represents a person chanting. The modeling of the eyes and mouth is noteworthy

JAR OF LARGE SIZE

Buenos Aires, Costa
Rica

The grace of proportions is matchless. The potter's wheel was unknown to the ancient inhabitants of the New World. The potter ordinarily worked by eye, building up the vessel in narrow ribbons of clay



"LAUGHING HEAD," FIGURINE OF CLAY

From southern Vera Cruz, Mexico. This gay little figurine is another successful study in human expression

must be frankly considered humorous figures. Their medium was clay. Human beings and animals, especially dogs, are treated lightly, almost as caricatures in some cases. The act is the preoccupation of the sculptor more often than the pose. To illustrate this characteristic we have grouped a pair of figures on the opposing page and the attempt to show action is obvious on the maker's part. A more dignified pose distinguishes the woman making a tortilla (page 575), but pure burlesque is the man who must have partaken too freely the evening before (page 567).

Stone does not yield itself freely to whimsical expression, particularly when stone tools are used in the shaping. But its very intractability is an aid in depicting a serious subject. An extraordinary contrast in racial mien is apparent in a comparison between the trachyte head from Copan and the mask from Central Mexico. The dignity of the soft lowland Maya (page 564) one might construe as the majesty of position or of rank, while the highland Nahua represented by the mask (page 565) is noble, but from force of character. These sculptures epitomize the racial difference between the two stocks. The seated figure from Vera Cruz (page 574) blends the two strains. The modeling is simple and direct, but in the treatment of the surfaces something soft and tropical creeps in. This impression is increased when one looks at the uncompromising rigidity of the Nahua mask.

A characteristic of the sculpture of Vera Cruz and to some extent of all Middle America is the use of naturalistic elements worked into a scheme of pure design. The wild turkey in the example we give on page 572 is carved against a palmate background,

the whole being more an effect of design than of sculpture in the round. This same combination of life-form with pure design is brought out by the stone disc carved in *champ-levé* (page 575), probably from the same area. Although the face is naturalistic, pure design elements are woven into so delicate a relation with it that the result is more a design than a presentation of life.

One of the most satisfactory mediums for the sculptor's art is wood, but owing to its quick decay it is rarely preserved. The mirror of polished obsidian (volcanic glass) shown on page 574 is surrounded by a wooden frame painted in gilt. The design is pleasing with its alternating squares of conventionalized flowers. Technically, however, the interest lies in the cutting and polishing of the obsidian of the actual mirror. The drum in the form of a tiger (page 573) is not only fine composition, but also exhibits a monumental quality, one of the striking characteristics of Middle American art.

Very often even the smallest objects have the capability of infinite expansion without detracting in any way from the harmony of their proportions. Also, large monuments may be diminished in the same way. Such a perfect relationship between the component parts of a figure as to permit its enlargement to monumental size occurs comparatively rarely. Other examples of monumentality are the effigy vessel from Vera Cruz which is reflected in the obsidian mirror and the



MONKEY DESIGN

Taken from a pottery stamp,
from the Valley of Mexico

Nahua mask of stone.

The conception of true form as exemplified by pottery manifests itself dominantly in Middle America. Almost in no other aspect of the arts does our



LARGE FIGURINES OF CLAY

The dog comes from the state of Colima, and the human figure is also from Western Mexico. Note how the vitality of each figure is brought out by placing the two together

classical training influence our appreciation and acceptance so deeply. But taking form and proportion as abstractions and not with relation to examples from a single national art, we find here harmonies of an entirely different sort. An excellent illustration of this feeling for pure form is the bowl from Chupicuaro, Mexico (page 568). The delicate convexity of the cylindrical vase from Salvador (page 573) removes from its shape the immobility of geometric form. Even according to Greek canons, what is more graceful than the high-shouldered pot from Costa Rica (page 569) built up by hand, and measured by eye, without the aid of a potter's wheel?

There is little left of Middle American painting. The decoration on the vessels from Salvador gives only a hint of the complicated drawing, of the extraordinary stylization that existed. Among the examples that have come down to us there

is some good anatomical drawing, but generally the exigencies of religious representation remove the paintings from the common ground of artistic appreciation. A beautiful example of brush work exists in the decoration of a bowl of late Aztec period from near Mexico City. A marine worm, a water plant, and a fish appear simplified to their essentials, but none theless retain the lively characterization of species that one finds in Chinese drawing. (See design at top of page 576).

In the New World, from what evidence we have now, the textile art was well developed before pottery received serious consideration. Thus the designs for pottery were often taken directly from textiles. When natural forms are used in the arrangement of designs, there is a strong tendency to conventionalize and order them into the regularity of textile decoration. Space forbids our showing more than one example, from Jalisco,



STONE SCULPTURE

Above.—Probably from the southern half of Vera Cruz, Mexico. The naturalism of the wild turkey is preserved, while the element of pure design is fulfilled

Right.—The design is from a pot from Estanzuela, Jalisco, Mexico, probably textile in origin

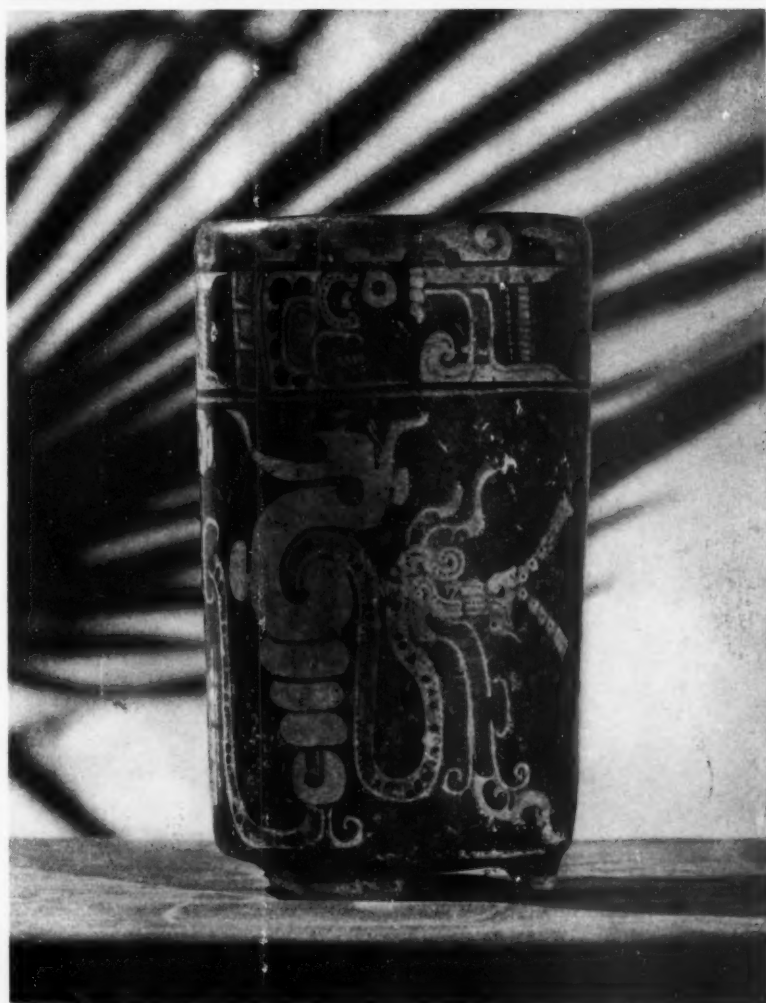




WOODEN DRUM

Puebla, Mexico

Above.—One of the few existing specimens of the wood-carver's art in pre-Columbian Mexico



POTTERY VASE, Nexapa, Salvador

Left.—This is decorated in polychrome. The draughtsman is hampered by the conventionalization of his style, and also of his subject, which is a feathered serpent emerging from a snail's shell



SEATED FEMALE
FIGURE, IN
STONE

Probably central
Vera Cruz. The
sculptor has avoid-
ed squatness and
heaviness in his
presentation of the
figure



OBSIDIAN MIRROR WITH
GILDED WOODEN FRAME
Presumably from Vera Cruz,
Mexico. Reflected in it is an
effigy vessel from near
Tampico, Mexico



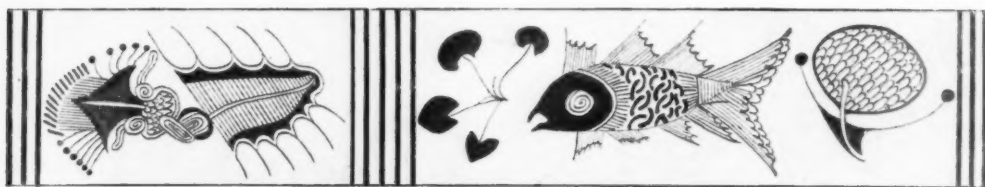
STONE DISC CARVED IN
LOW RELIEF

Doubtless from southeastern Mexico. The cutting is exquisite, while a balance is struck between pure design and naturalism

LARGE POTTERY
FIGURE OF WOM-
AN MAKING A
TORTILLA

From Ixtlan, Nayarit, Mexico. Anatomical peculiarities are accentuated, but at the same time a realistic feeling is brought out by the vigor of the pose and the details of dress and ornament





DESIGN FROM THE INSIDE OF A BOWL OF THE AZTEC PERIOD, VALLEY OF MEXICO
A marine worm, water plants, and a fish are shown with a clear recognition of their species

Mexico. This is pictured on page 572. The applicability of these patterns to embroidery is an unexploited field and might open up more significant styles than the less purely textile decorations of the Peruvian ceramic.

Often stamps were used to print designs on cloth or even on the skin (pp. 564, 565, 570). The feeling is as textile as the painted patterns. Animate forms are reduced to their generic essentials. Pure design is handled in such a way that the elements have enough interest to overcome the monotony of repetition.

We have limited this discussion of some of the phases of Middle American Art to examples contained in the American Mu-

seum and to specimens that are associated with the life of the individual. A consideration of architecture, of the stelæ on which the Maya recorded time, and of the elaborate religious arts, would lead us far afield into a vast and complicated study of the religions, governments, national influences, and race of the Middle American peoples, in addition to the points suggested here. Art is always a reflection of its creator's perceptions and his habits of mind. Once one sympathizes with the controlling factors in the arts of the Middle American peoples, the coldness and the complexities fall away in the very perfect expression of the ideals and ideas of these little-known nations.



DESIGN FROM INSIDE OF A BOWL
Aztec period, Valley of Mexico
A representative treatment of balance and rhythm

THE APE-MAN OF JAVA

Does this Fossil Prove that a Creature Which Was in a Halfway Stage Between Man and Ape, Lived about a Million Years Ago?

By W. D. MATTHEW

Professor of Paleontology, University of California

ILLUSTRATED BY A. A. JANSSON

In this article Doctor Matthew has written, first, an imaginary description of a group of Java ape-men in the setting to which it is supposed they were native. Then comes a discussion of the evidence on which the word picture is based. The setting is given in the following note.—THE EDITORS.

SCENE:

A tropical forest, rather open, with huge, straight-boled trees scattered about. Some underbrush, but not enough just here to interfere with travel for either man or beast. A trail, half obscured by leaves and brush, that winds snakily across country, crossing or meeting with other trails and parting again, an endless labyrinth, familiar enough to the residents, quite hopeless to a stranger. For hundreds and hundreds of miles this labyrinth of forest trails extends to the north and west, mostly over broad, flat, swampy bottom, here and there with stretches of rugged hills and mountains where the dense and impassable jungle of the lowlands with its close-set trees and heavy underbrush thins out into open glades and scattered trees. Southward, if we should follow the trails a few day's journey, lies an irregular coast, rugged and rocky in places, heavily embayed elsewhere with swampy forests and a foreshore of gleaming sands all studded with swaying coconut palms. All along the coast, sometimes tied to the mainland, sometimes as separate islands offshore, lies a string of active volcanoes, steep, conical or irregular peaks, many of them emitting a trail of smoke to float off down wind.

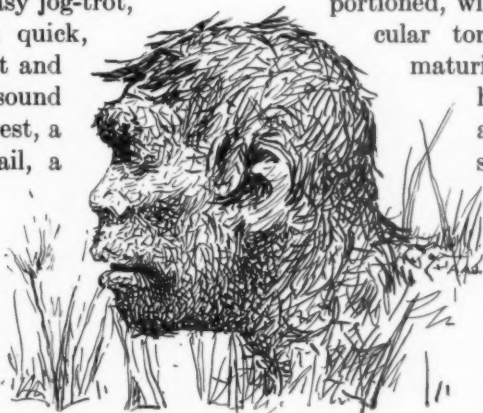
THREE ape-men come trotting down one of the trails, tall, upright, broad-shouldered, their gleaming brown skin half concealed by sparse black hair. They run at an easy jog-trot, steady, watchful, with quick, flashing glances to right and left, noting the least sound or movement in the forest, a broken leaf by the trail, a displaced branch underfoot.

Every now and then they slow down to a walk or stop to examine some new or unusual object, track, or mark, crowding around it to see better, pointing and gesturing and expressing ideas in a sort of rude language of clicks and grunts. In their manner, their activity, and quick, changing interest, they

are like a group of small boys, perhaps on their way to the swimming pool at the back of the woodlot. But they are tall, six feet in height, powerfully proportioned, with the heavy muscular torso and limbs of maturity, and the black hair over body, arms, and legs, while scanty for a beast, is too heavy to seem quite human.

The head is covered by a thick shock of tousled hair hanging over the sides and back of the neck. The

prominent eyebrows form a heavy dark shelf shadowing the deep-set eyes, and the powerful projecting muzzle is nearly as big and heavy as in a gorilla. The set of the head on the shoulders, too, is



quite ape-like, and the retreating forehead, heavy black-whiskered jowls, and fierce and bestial expression are quite in contrast with the quick, restless, boyish activity of the running figures seen from a distance.

These are no harmless children—they are the rulers of the forest, savage, dangerous, and destructive, justly feared by all the animals of the jungle because of their uncanny cleverness and activity, and detested because of their restless, mischievous curiosity. Fortunate, perhaps, for the rest of the forest-dwellers that these ape-men are mainly vegetarian in their diet and have not the killer instincts of the weasel family!

Even as it is, none of the jungle beasts, not the lordly elephant or the sulky rhinoceros, not even the tiger or the leopard, is safe from their mischief and deviltries. For, like the little monkeys in the tree-tops, they refuse to abide by the first law of the jungle—mind your own business—and the meddling curiosity that was but a slightly annoying propensity in the monkey has ripened in the ape-men into a spirit of investigation and experiment that affords infinite interest and amusement to themselves, along with a considerable spice of danger from some of the exasperated objects of their attentions.

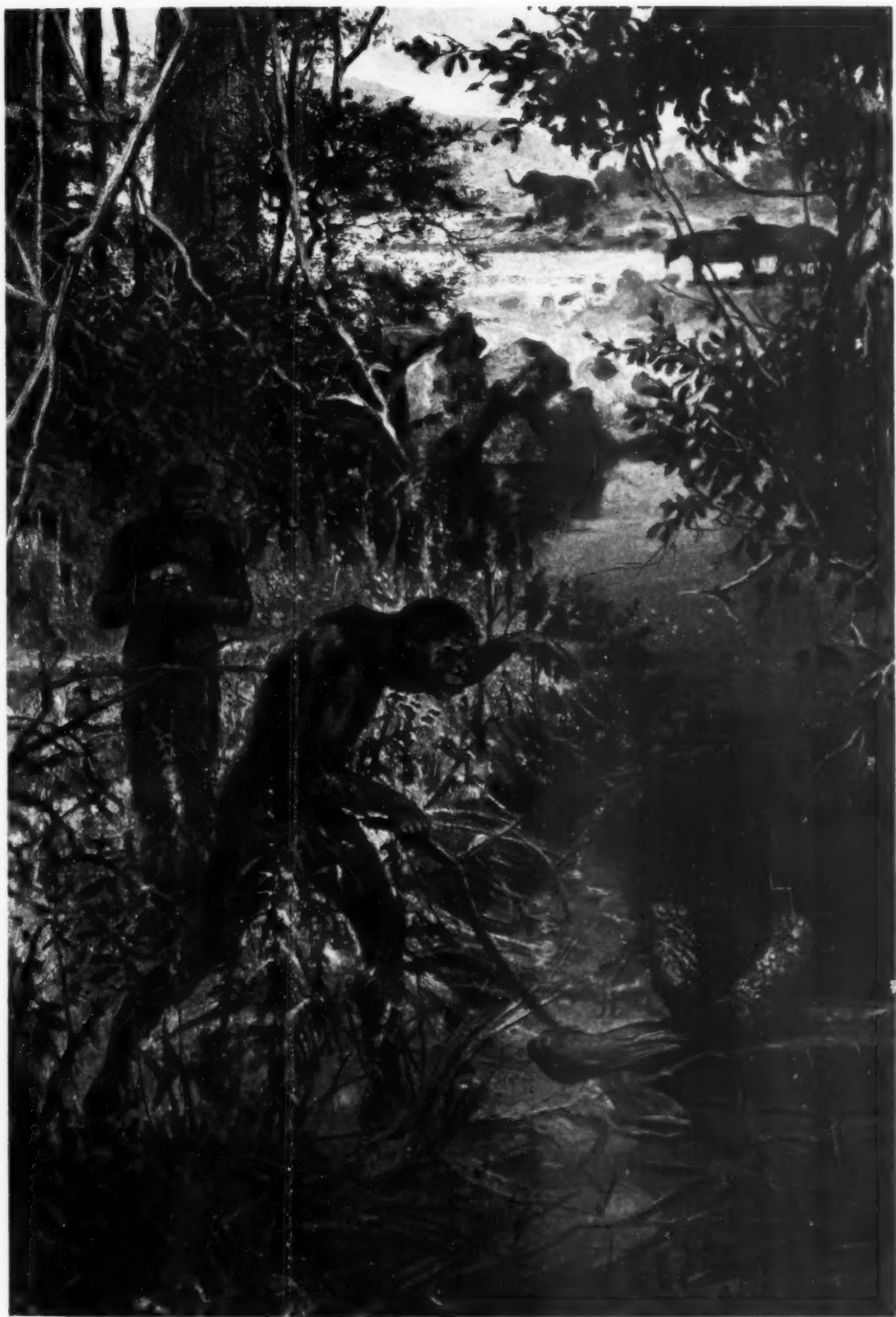
Like the gang of boys which they suggested at a distance, our ape-men are really bound for a swimming-hole. It lies across the trail a short distance ahead, a broad, deep pool in a small river that in this dry season is a mere trickle above and below the pool. Here converge several trails, for it is a favorite drinking-place, and many of the larger animals for miles around find their way here during the day or night. Most of these are animals much like those that come to drink at a similar pool today—deer and cattle and forest-dwelling antelopes, elephants and rhinoceroses, and various large and small car-

nivora, porcupines and squirrels and other rodents. With these are some beasts now extinct, or unknown in this part of Asia.

A couple of hippopotami have made their home in the pool, and it is sometimes haunted by crocodiles, so that it is well to splash about a good deal and throw stones and sticks at any suspicious-looking objects in the water before venturing into its depths.

On the far side, driven off by the disturbance, a couple of gigantic tapirs retreat into the forest. They are much like the modern Malayan tapir, but as large as a dray-horse. A curious animal goes off with them, a chalicothere, with long neck and small, horselike head, the body of a tapir, and legs long in front and short behind, the feet bearing large claws instead of hoofs. He shuffles off with a curiously clumsy gait, carrying the claws sidewise as he goes, a shy, defenseless animal, hiding like the tapirs in the thickest depths of the jungle.

The next thing that draws the attention of our ape-men is a huge tortoise slowly and ponderously climbing up the steep bank. The massive shell, thick, heavy legs and neck, with small, blunt head, are like the modern giant tortoises of some oceanic islands. But he is enormously larger, the shell seven feet long and the rest all in proportion. As the ape-men come near him, he snaps futilely at their nimble figures, and then draws in head and legs and stubby tail under the protection of his massive shell. A perfect protection, this, against the teeth or prying claws of his carnivorous enemies, and his huge weight of nearly two tons is too great to be rolled over easily. This, however, is what the ape-men next try to do, and, by taking advantage of the slope and their united strength, they topple him over the bank to the sandy margin of the pool, where he lies upside down and helpless, waving head and legs about in a vain effort to get back on his feet again, snap-



TEASING THE GIANT TORTOISE

Like a gang of bad little boys, the ape-men topple the huge reptile over the bank to the sandy margin of the pool, where he lies helpless and snapping furiously at the sticks with which his tormentors prod him

ping furiously at the sticks with which they proceed to poke at any soft corners of his anatomy that they can reach. Soon tiring of this sport, they seek for more active game.

A movement and rustle in a leafy covert brings a shower of heavy and well-directed stones, which serves to dislodge a tiger lurking there. He springs for a moment into the open, then slinks off, bruised and battered, well aware that he stands but little chance of coming to close quarters with these active wily enemies, who at last resort could always scramble up a tree just out of reach and thence continue the attack with sticks and branches. The tiger driven off, the ape-men amuse themselves by pestering some of the smaller animals, routing out some of them from their holes or sheltered corners around the roots of trees, and exchanging missiles and abuse with a troop of monkeys in the tree-tops.

Pretty soon a rhinoceros comes down the trail toward the pool, and the ape-men begin throwing stones and sticks at him, irritating his natural sulkiness into a blind fury of rage, tempting him into useless charges, and dodging his clumsy rushes behind trees or rocks until he goes off battered, half blinded, and senseless with fury, his original purpose of a drink quite forgotten, chasing an imaginary ape-man whose original has long since dodged away from his path.

The next comers are a small group of elephants, a big bull in the lead, followed by two or three females and two young calves. They are not quite the modern elephant, although they look enough like it externally. The teeth, could one examine them, are short-crowned, with cross-crests instead of the vertical plates of the modern species. The bull has good-sized tusks, the females and young have none; the shape of head and proportions of body and legs are much as in the Indian elephant. This is the *Stegodon*, which

was common throughout Asia in the days of the ape-man. Another species of proboscidean with which our *Pithecanthropus* was acquainted was the short-faced mastodon, smaller in size, with shorter legs and trunk, a low forehead, and teeth still less like those of the elephant, having only a few low irregular cross-crests instead of the serried ridges of the *Stegodon* or the vertical plates of mammoths and elephants. But we cannot meet the whole fauna of Pleistocene Java on this particular bathing excursion.

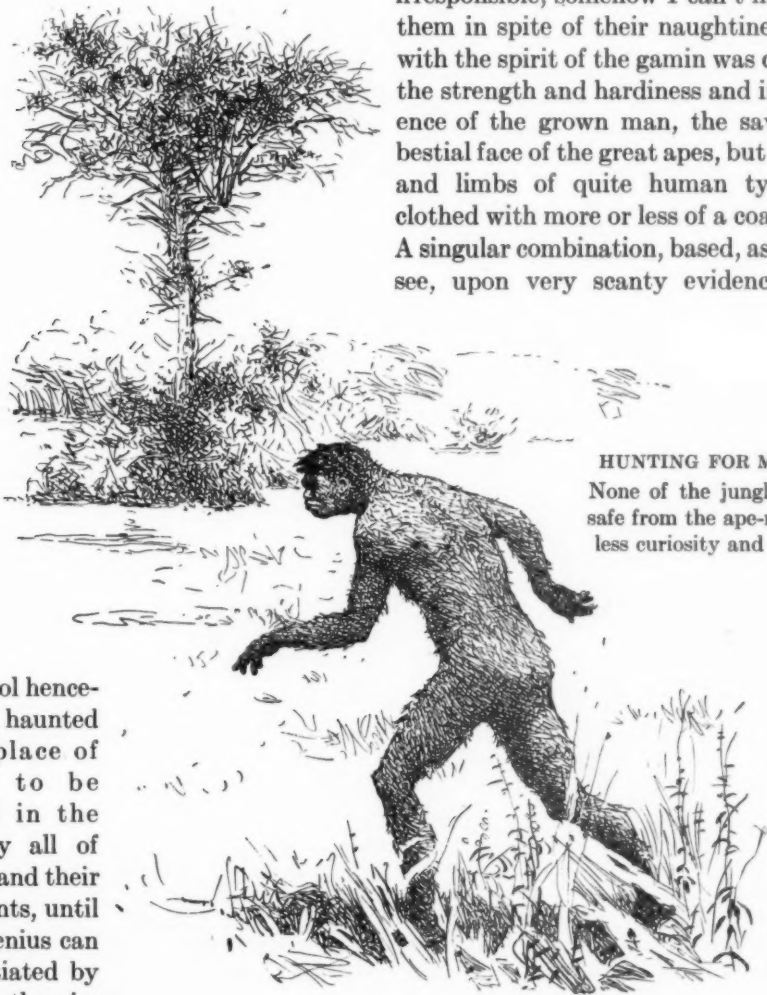
The *Stegodons* have a good memory, a keen sense of smell, and some very annoying recollections of ape-men. They promptly scent our heroes and, forgetting all about the water-hole, proceed to a vigorous and angry search for them, ineffective, because the ape-men are well aware that an elephant is a dangerous adversary, clever and with a long reach, and they keep well out of the way of the big beasts, but devote themselves to pelting the unfortunate little calves with heavy stones at every opportunity, until, bruised and terrified, the young elephants rush off down the trail and vanish in the distance, followed by their mothers, and after a little, by the bull, still angry but hopeless of any effective vengeance on his tormentors.

Now, the coast being clear for a while, the ape-men make for the pool to take a bath and cool off a bit after their somewhat heated interviews with rhinoceros and *Stegodons*. They splash into the water, ignoring the poor tortoise still lying on his back, but ever watchful for possible enemies in or out of the water. One of them, a little more daring than the others, plunges into the deeper water in the center of the pool and swims over toward the other side. Too far, alas, for with a sudden swirl of water a crocodile darts out from under the far bank, seizes the unhappy ape-man by the leg before he can get out of reach, and drags him

down to be drowned and devoured at leisure. His companions, very thoroughly frightened for once, splash back to the bank and up the trail at top speed, the last choking scream of their companion ringing in their ears, back to the lair which serves as headquarters or base-camp for the little tribe of ape-men.

reappear, a bit of rare historic record of the existence of a long-vanished race in a changed and civilized world.

Does this rude sketch sound like the escapades of a gang of bad little boys? I hope so. Because that is just what the ape-men were, as I think of them. Clever and restless, mischievous, inconsequent, irresponsible, somehow I can't help liking them in spite of their naughtiness. And with the spirit of the gamin was combined the strength and hardiness and independence of the grown man, the savage and bestial face of the great apes, but the body and limbs of quite human type, only clothed with more or less of a coat of hair. A singular combination, based, as we shall see, upon very scanty evidence, yet I



HUNTING FOR MISCHIEF

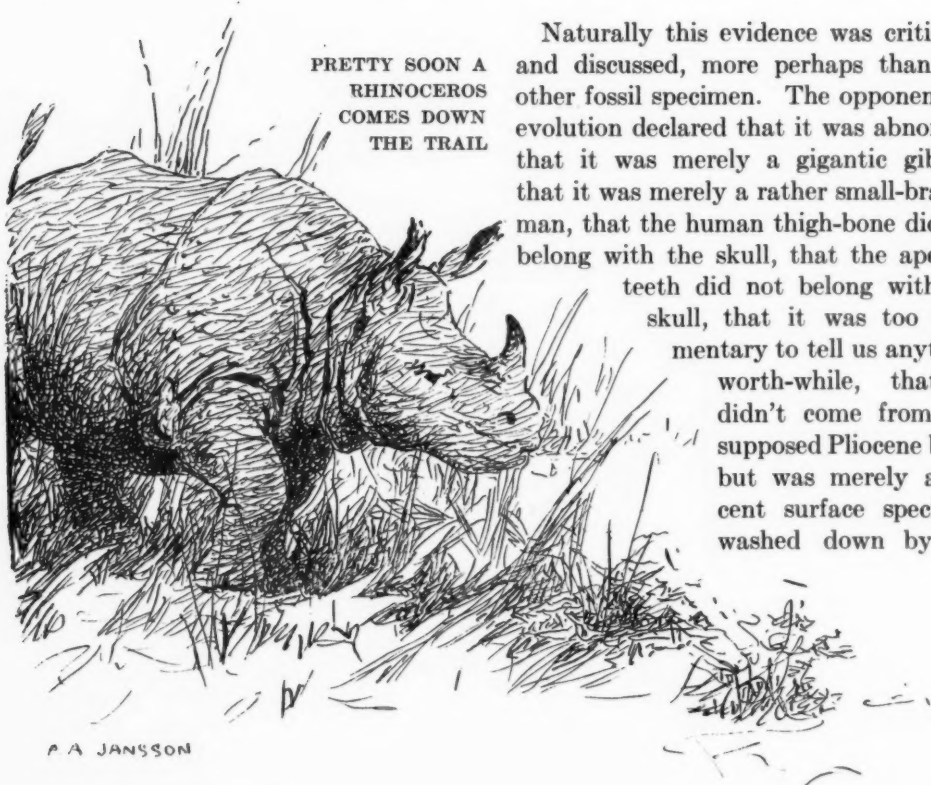
None of the jungle beasts is safe from the ape-men's restless curiosity and deviltries

The pool henceforth is a haunted spot, a place of horror, to be avoided in the future by all of the tribe and their descendants, until its evil genius can be propitiated by gifts from the wise old patriarch of the clan.

Of the unfortunate victim left to be devoured, only a few broken bones remain, washed down by the next flood and buried in the sand of the river, to remain there through the geologic changes and upheavals of a million years, and finally to

think on the whole the most probable concept that we can build up from such facts as are to be had. Some day, when Java or other regions of central and southern Asia have been more extensively explored for fossils, we shall know how near this picture is to fact.

PRETTY SOON A
RHINOCEROS
COMES DOWN
THE TRAIL



THE EVIDENCE UPON WHICH THE FOREGOING
WORD PICTURE IS PRODUCED

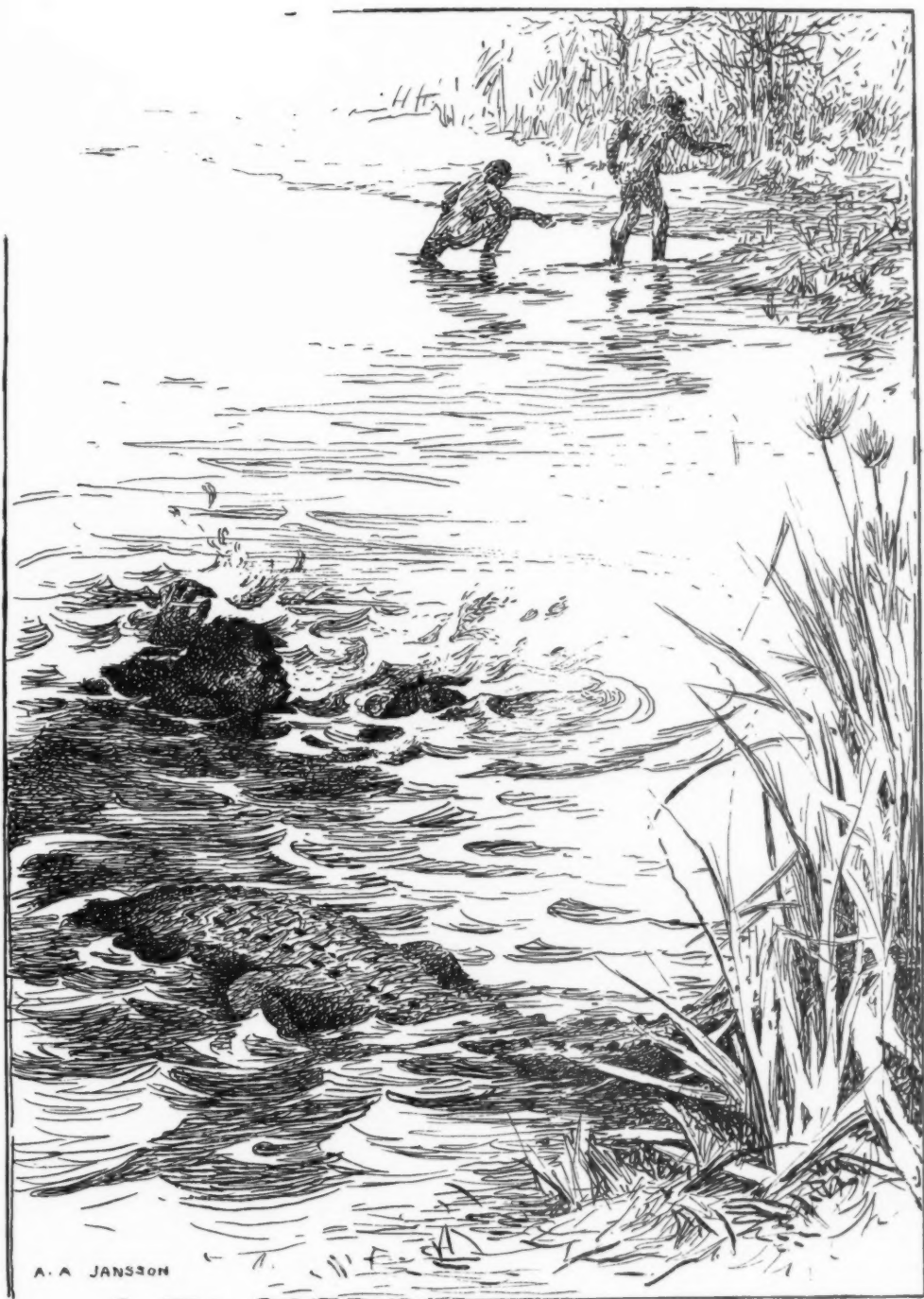
Thirty-seven years ago Dr. E. Dubois discovered a fossil skull-cap, a couple of teeth and a thigh-bone, which he called *Pithecanthropus erectus* and described as intermediate between man and the anthropoid apes. These remains were found at Trinil on the Solo River in central Java, all in one stratum but the teeth two or three feet away from the skull, and the thigh-bone forty feet away.

The formation was at that time considered to be of Pliocene age. The skull-cap was shown to be intermediate in brain capacity and other features, the teeth were more ape-like, the thigh-bone distinctly human. If, as seemed probable, they all belonged to one species, it conformed very well to the specifications of the "missing link" between man and the higher apes, for which the evolutionists had been hoping, as proof of their contentions.

Naturally this evidence was criticized and discussed, more perhaps than any other fossil specimen. The opponents of evolution declared that it was abnormal, that it was merely a gigantic gibbon, that it was merely a rather small-brained man, that the human thigh-bone did not belong with the skull, that the ape-like teeth did not belong with the skull, that it was too fragmentary to tell us anything worth-while, that it didn't come from the supposed Pliocene beds, but was merely a recent surface specimen washed down by the

river, that the beds were not Pliocene anyhow but Pleistocene or recent.

The champions of evolution were equally confident, not merely of the soundness of Doctor Dubois' conclusions, but of the complete accuracy and certainty of the reconstructions and restorations of the Java ape-man built up from them by sculptors and artist-scientists, of his precise position in the ancestral line of the human race, of the length of his hair and the color of his finger nails, and just what he brought home to his wife every night for dinner. No two of the bolder protagonists of either side agreed with each other, but each of them was very certain that he alone was right and all the others partly or wholly wrong, especially about the things he and they didn't really know. Such is the usual course of controversy. The further it is carried, the more absurd become the claims of the zealots of either side.



THE TRAGEDY AT THE SWIMMING HOLE

With a sudden swirl of water the crocodile darts out from under the bank, seizes the ape-man by the leg, and drags him down to be drowned and devoured at leisure

Usually such a controversy is settled sooner or later by further exploration and additional discoveries which show where the truth of the matter really lies. This was what happened to the 'Neanderthal Man,' first known only from a skull-cap, now from a series of complete skeletons. Even more impressive is the evidence for the evolution of the horse, first sketched out from few and fragmentary specimens, now known from many finely preserved skeletons representing every stage in its fossil record.

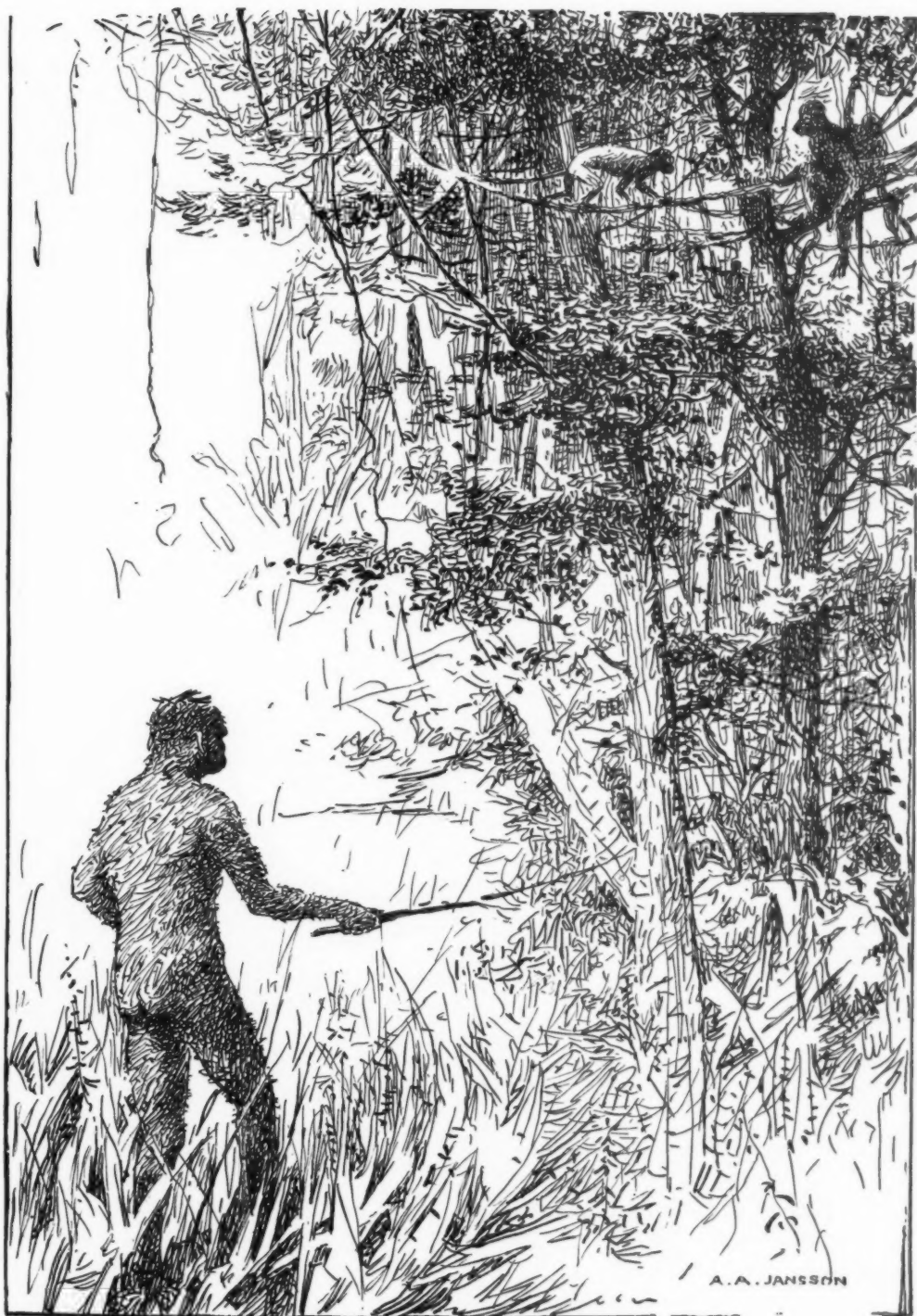
But surprisingly little has been added to the fossil evidence for the existence and characters of *Pithecanthropus*. Partly this is because the discovery was not a casual find on the part of Doctor Dubois, but came as the culmination of an energetic and wide exploration over two years' time of the Tertiary and Pleistocene formations of the island, in the course of which he made an enormous collection of its extinct animals and some other interesting but little known remains of fossil man. Partly it is because the island is far away from the principal centers of scientific research and further exploration is difficult and expensive.

A German expedition under Madame Selenka in 1910 worked for two summers at and near the locality; and the Geological Survey of Java has in recent years made search at two or three other promising localities, and has studied and mapped the formation in which the famous fossil was found. But although large additional collections of fossil animals and plants have been obtained, and much new evidence as to the age and geological relations of the formation, no additional remains of *Pithecanthropus* have come to light except two teeth found by the Selenka expedition.

The formation is the topmost member of a great anticline or uplift of Tertiary rocks that extends along the northern side of the island, but the age of the bone-

beds is now considered as more probably early Pleistocene, at the beginning of the Glacial Period, instead of Upper Pliocene, just preceding it. The writer of this article had the privilege of spending two weeks as the guest of the Geological Survey of Java in company with one of its ablest geologists, Dr. L. J. C. Van Es, going over the principal exposures of this formation, and is confident that an adequate and well-planned search would bring to light not only a great series of fossil remains of the fauna with which our *Pithecanthropus* lived, but also more and better evidence of the "Missing Link" himself. Two years ago it was reported in the newspapers that a second skull had been found, but this specimen, when examined by scientists, turned out to be a fragment of the head of the humerus (upper arm bone) of a fossil elephant (*Stegodont*), the rounded convex form of which had suggested to the discoverer that it was a human skull.

One very interesting fact has been brought out by later exploration and research. The fossil animal remains found in this formation are quite nearly related to the Upper Siwalik fossils of northern India, a classic and well-known fauna generally regarded as being of Upper Pliocene age, but by some authorities placed at the base of the Pleistocene. The Java fauna corresponds to a part only of the Upper Siwalik. It lacks the horses and camels and most of the antelopes—animals adapted to open plains and deserts. But the elephants and stegodons and mastodons, the hippopotami and rhinoceroses, the cattle and deer, the gigantic tortoise and other less conspicuous mammals and reptiles appear to be closely related to those of northern India. Furthermore, the geological studies of the islands and seas north and west of Java make it probable that in the Pliocene and early Pleistocene much of this area was continental, and that the long anticlinal ridge on the



MEDDLING CURIOSITY

The ape-man exchanges missiles and abuse with a troop of monkeys in the tree tops

northern side of the island was then the southern boundary of a continental land where now is the shallow Sunda Sea, while the great range of volcanoes on the southern side of Java had not yet arisen from the deep abyssal ocean that lies to the south of the island.

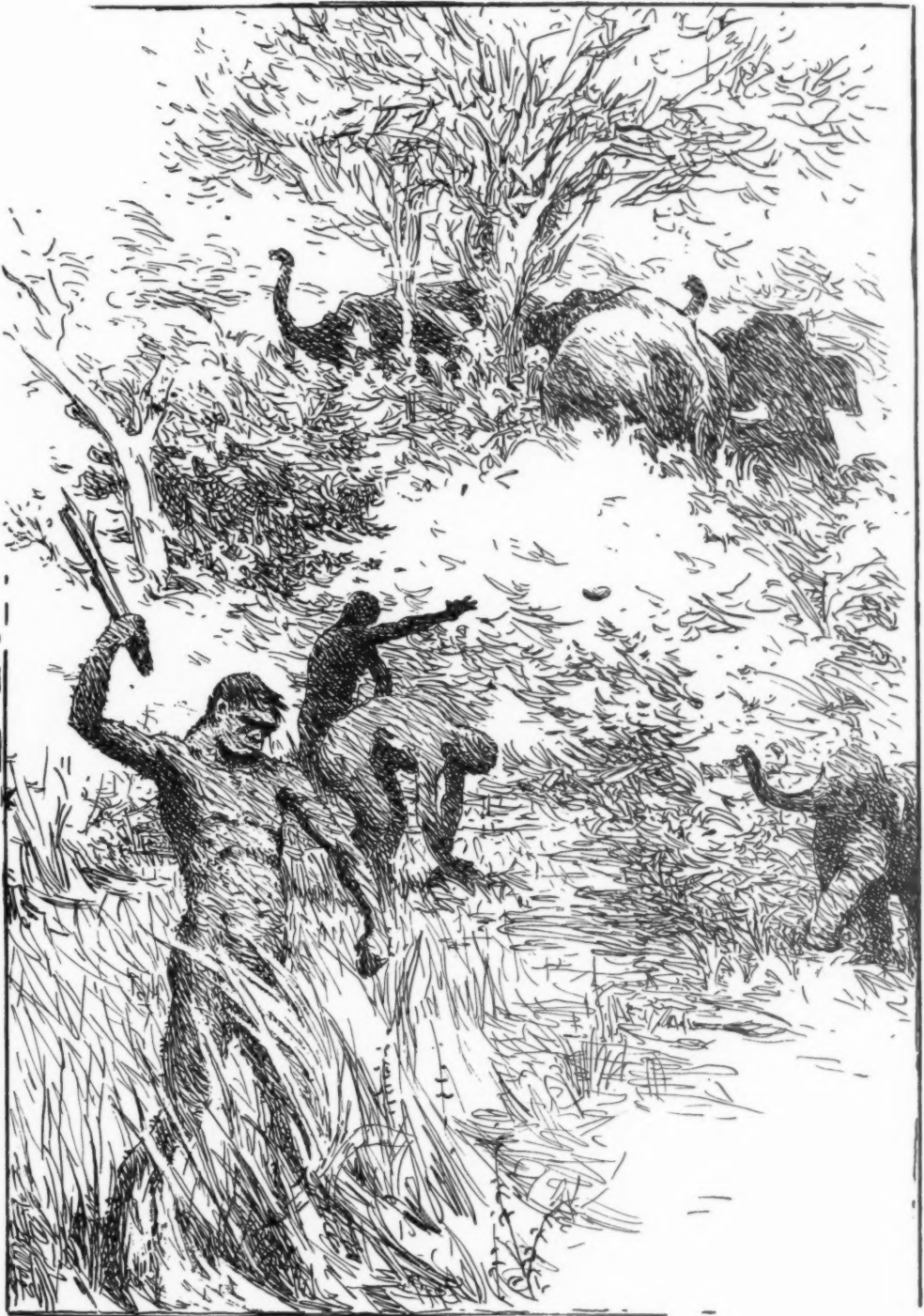
Probably then the fauna with which our *Pithecanthropus* lived had come from far to the north, from central or eastern Asia, leaving behind those races adapted to plains or desert, only the animals suited to jungle and tropical forest being able to make their way to the well-watered and densely forested region of Malaysia. Did the *Pithecanthropus* accompany them from India? That we do not know, for no remains have been found in the Siwalik which can be attributed to him. But it is suggestive that in the preceding formations of Lower Pliocene and Upper Miocene age various fragmentary remains have been found, considered by Doctor Gregory and other careful students as representing the common ancestor of man and the higher apes, and of this *Dryopithecus* more remains have been found in northern India than in all the rest of the world. It seems reasonable to conclude from the evidence that the *Pithecanthropus*, whatever his exact relationship to the *Dryopithecus* on one side and to man on the other, had originated somewhere in central or southeastern Asia and made his way to what is now the island of Java about the end of the Tertiary period or while it still was part of the mainland, in company with that great assemblage of animals that we call the Upper Siwalik Fauna.

How much do we really know about what the *Pithecanthropus* was like? How much of the restoration is certain or highly probable, how much is doubtful or speculative? Do we really know anything at all about his habits, or is that "just guess-work," as Mr. Bryan said of the whole theory of evolution. Well, the answer

here turns first upon the correlation of parts in the anatomy of animals, on which Cuvier insisted so strongly a century ago; second upon whether the skull-cap, teeth, and thigh-bone belong to the same species. The skull-cap definitely and unmistakably belongs to a higher primate, an anthropoid intermediate between the higher apes and man, and about as near to the one as to the other. The brain-case shows that the brain was about half-way between those of anthropoid apes and man in size and in structure (they are all astonishingly alike in everything except relative size). As far as his brain goes, our *Pithecanthropus* is definitely and directly proven to be a half-way stage between man and ape.

Cuvier's law of correlation, verified by a century of study of skeletons of modern and extinct animals, makes it reasonably certain that the construction of the rest of the skull, and of the soft parts that covered it, was also that of all other higher primates, that is to say somewhere between the extremes shown in gorilla and man. It does not at all follow that because the brain-case is half-way between the two, all the other parts of the skull, jaws, or skeleton are half-way. That in fact is an extreme improbability, and conflicts also with the evidence of the teeth and of the thigh-bone. The probabilities really are that the *Pithecanthropus* was in some respects nearer to man, in others to one or another of the great apes, and had likewise some peculiarities of its own. The character of the teeth would suggest that it had more of the powerful, projecting, heavy-tusked jaws of the ape than the small, rounded jaws of man. On the other hand, the femur, (thigh-bone) remarkably like that of modern man, suggests to everyone, as it did to Dubois when he named the species, the long straight legs and erect gait of our own species.

Do the teeth and femur really belong to



A HEATED INTERVIEW

At the pool the three ape-men pelt a family of elephants with heavy stones until, bruised and terrified, the animals rush off down the trail and vanish in the distance

Pithecanthropus? That is not certain. But if not, then there were two or else three extinct species of higher primates living at the same place and time in Java, and one fragment of each just happened to be entombed in the same layer and only a few feet apart. That is possible, but until there is some evidence that it is true, it is simpler to assume that they all belonged to the one species.

If we start from this postulate, we can make three inferences about our Java ape-man, the first as a certainty, the second and third as probabilities.

(1) The type of mind and manner of thinking and acting was that of the higher apes and man, and his intelligence about half-way between the two. Anyone who has followed the recent psychologic experiment on chimpanzees cannot fail to see the very human way in which their minds work. But in degree of intelligence they are children. *Pithecanthropus* had also the mind of a child, but of an older or more intelligent child.

(2) The teeth, so far as known, are ape-like, not manlike. The inference may be drawn that jaws and teeth as a whole were like those of the great apes, massive, projecting, squared, with prominent canines and relatively powerful front teeth. This construction, as Gregory has shown, is only incidentally useful for fighting, and primarily intended for breaking and crushing large solid-shelled fruits which are common in the tropical forests of the Old World. In other words, it is an adaptation to vegetarianism, and the weak, reduced jaws and small front teeth of man are an adaptation to a diet of meat and small grains—the food of the temperate and northern plains, as the heavy-shelled fruits are of the tropical forest. It appears probable, then, that *Pithecanthropus* lived like the gorilla,

chimpanzee, and orang, chiefly upon fruits and nuts, and was not a meat- or grain-eater. With such similar food habits would inevitably go a similar habit of mind to the modern great apes, diverse in many details from the mind of primitive or savage man.

(3) The long, straight leg, quite human in type, indicates a terrestrial, not a tree-dwelling habit,—an erect gait much like our own. While it does not exclude climbing trees, it does rather definitely indicate a normal upright gait. With this, as with the supposed food-habits, we may associate certain mental reactions. The arboreal animal is at home in the trees. On the ground he is awkward and clumsy, indisposed to venture far from his natural refuge, and quick to seek shelter there from any form of danger. The terrestrial animal is more ready to venture into the open, more able to escape by running, prefers to dodge behind a tree for shelter and observation rather than to run up it, and is likely to climb for safety only when attacked by strictly terrestrial enemies.

Our *Pithecanthropus* is a boy in the forest, not a monkey, though he has the monkey's superior interest in fruits and relative indifference to small animals. His size, equalling that of a tall man, plays an important part in his attitude toward other animals. A far more important factor, had we any line on it, would be his social habits—whether largely solitary, or combined in small family groups or in larger clans or tribes. I have assumed a simplified human grouping, a small tribe with sub-grouping by sex and age, but this is pure assumption, necessary because you cannot draw a picture without it; just as you have to give an extinct animal some pattern of color and hair, although whatever you adopt is probably wrong.



Photograph by Roy Waldo Miner

STORMS AND STORM TRACKS

A Brief Statement of the Origin, Development, and Movement of
Thunderstorms, Cyclones and Anticyclones, Tornadoes,
Waterspouts, Hurricanes, and Typhoons

By CHESTER A. REEDS

Curator of Geology and Invertebrate Paleontology, in the American Museum of Natural History

*The winds grow high;
Impending tempests charge the sky;
The lightning flies, the thunder roars;
And big waves lash the frightened shores.*

—PRIOR.

THE late West Indian hurricane, which left destruction in its wake in the Windward Islands, Porto Rico, the Bahama Islands, and Florida, and which passed northward across the United States to the vicinity of James Bay, Canada, before turning eastward, calls special attention to hurricanes and the various other types of cyclonic storms, as well as to their storm tracks.

Storms may be local, such as the thunderstorm, or they may be great whirling masses of air oftentimes a thousand or more miles in diameter, such as the hurricane, the cyclone, or the anticyclone. They may be mild in character, such as the passing shower, or violent like the tornado and the hurricane.

Thunderstorms have been more generally observed than any other storm. They occur in nearly every part of the

world, but the number decreases rapidly from the equator toward the pole. Thunderstorms are caused by the sudden rise of a large mass of moist warm air, hence they are common in the tropics and frequent in temperate latitudes during the summer, while over the sea in high latitudes they occur during the winter. The body of moist rising air cools, due to expansion, reaches its dew point, and builds the immense cumulo-nimbus cloud, the rain cloud, which in cross-section may be anvil-shaped in appearance and occupy a space from one to four miles in height and forty to seventy miles from front to back when well developed. These clouds yield an abundant precipitation, a marked drop in temperature, and an outrushing violent squall wind which just precedes the rain. It was formerly thought that thunder and lightning, which accompany such storms,

produced the storms, but it is now known that they are not the cause, but are secondary features and result from the condensation of the cloud.

The path of a thunderstorm is frequently pear-shaped, the beginning being but a few miles long and a mile or two wide. As the storm develops and moves forward, it becomes constantly larger, so that at the end of six or seven hours it has a front one hundred and fifty to two hundred miles long by some forty miles wide. Some thunderstorms last for more than twelve hours, and cover territory about five hundred miles long by as many miles wide at the terminal end. The average velocity of these storms for the United States is from thirty to forty miles an hour, while in Europe it is between twenty and thirty miles.

Thunderstorms are most frequent in the late afternoon or early morning. Regionally they are most numerous in the

humid parts of the tropics where several occur each week during the rainy season. They are rare, but not unknown, in polar regions, and are rare in the deserts and in the trade-wind belt of the ocean. In the United States they are most frequent in the humid southeast and less frequent along the Pacific coast where little of the rainfall occurs in summer. In the temperate and tropical zones most of the severe thunderstorms are associated with cyclonic depressions.

A cyclone is a system of winds blowing toward a common center. The name was first suggested by Piddington early in the Nineteenth Century. It is derived from the Greek word for circle, hence it embodies the idea of a circular or spiral movement of the winds. An anticyclone is a system of winds flowing outward from a common center. The name was proposed by Galton in 1863, and means the opposite of cyclone.



P. and A. Photos

LIGHTNING FLASHES DURING A THUNDERSTORM

The lightning in a storm becomes more frequent and more severe as the rain increases



Photograph by Brown Brothers

A THREE-MASTED SCHOONER GOING DOWN AFTER A STORM AT SEA

The sinking of this vessel in mid-ocean as the result of a severe storm is typical of the days of the "clipper ships," when hurricanes were not so well understood as now. Note the only survivors leaving in a small boat at the stern of the sinking ship

It may be observed on a weather map, or a barometer, that the wind circulation in a cyclone and in an anticyclone is controlled by areas of low and high barometric pressure, respectively. This was first noted by Buys-Ballot, a Dutch meteorologist. His observation has become a law, which holds true for the Northern Hemisphere, and may be stated as follows:

Stand with your back to the wind, and the barometer will be lower on your left hand than on your right.

Pressure is thus one of the most important elements controlling the movement of storms. It is determined by a mercurial barometer, an instrument that registers in hundredths of an inch the number of inches of mercury the weight of the air holds up in a glass tube. Unlike the temperature, or the wind, the pressure of the air cannot be determined by our own senses without instrumental aid. When plotted on a map, lines of equal

barometric pressure, called isobars, may be developed. They are of service to meteorologists in locating storm areas, in tracing their movements, and in forecasting the weather.

The examination of an isobaric chart of the world will show the presence of great oval areas of low and high pressure covering a whole continent, or a whole ocean, and keeping about the same position for months at a time. Teisserenc de Bort (1887) called these areas "centers of action." For instance, on an isobaric chart showing the mean pressure over the world in January, there are immense areas of high pressure (anticyclones) over the great land masses of the Northern Hemisphere with spirally outflowing winds, and immense areas of low pressure (cyclones) with spirally inflowing winds over the North Pacific and North Atlantic oceans. In July the barometric conditions are reversed for the northern continents. This replacement of the high pressure of

winter by the low pressure of summer is due to the continental areas being alternately colder in winter and warmer in summer than the adjacent oceans.

When there comes a change, in any region, from low pressure to high pressure, or *vice versa*, the system of winds in that region will also change. Many such changes of pressure and winds actually occur in different parts of the world, and are of great importance in tracing the movements of storms and interpreting the climate. The best-known of all these changes occurs annually in India. During the winter an anticyclonic area of high pressure is central over the continent of Asia. The winds blow out from it on all sides, thus causing generally northeasterly winds over the greater portion of India. The winds are prevailing dry and clear, and the weather is fine during the time they blow. India then

has its dry season. As the summer comes on, the pressure over Asia changes, becoming low; a great cyclonic area replaces the huge winter anticyclone, and inflowing winds take the place of the outflowing ones of the winter. The summer winds cross India from a general southwesterly direction. They come for long distances from over the Indian ocean, and are thus moist and rainy. India then has its rainy season. These seasonal winds are known as monsoons, a name derived from the Arabic, and meaning seasonal.

The ceaseless changes in the weather of the temperate zones are due almost entirely to the approach and passage of smaller cyclones and anticyclones, the "lows" and "highs" respectively, which appear on daily weather maps of the United States Weather Bureau and those of other nations. They are secondary pressure disturbances which arise in the



Photograph by Brown Brothers

A SQUARE-RIGGED SHIP AGROUND ON THE NEW JERSEY COAST

This sailing vessel was driven off its course by a sixty-mile-an-hour gale to founder in water too shallow to float it. Stuck fast in the sands of the beach, it is being pounded to pieces by the waves. The depth of the trough to the right of the vessel shows that a high sea is running



Photograph by Brown Brothers

A WATERSPOUT OFF THE COAST OF MASSACHUSETTS

The funnel-shaped vortex of this waterspout is long and slender and slightly curved; at the base of the dark cloud and where it touches the calm sea, it has a greater diameter than in its mid-section. Like the tornado and the hurricane, the waterspout is a violent and destructive type of storm, and its path should be avoided where possible

general circulation of the atmosphere and should be differentiated from the sub-permanent oceanic and continental areas of low and high pressure, or "centers of action," noted above. Where westerly winds prevail, these "lows" and "highs" move from west to east and greatly affect the weather. In 1885-1887 Loomis, of Yale, made an extended study of the form and dimensions of these areas. He found the average form of the areas of low pressure to be elliptical, the longer diameter being nearly twice as long as the shorter (ratio 1.94:1) with the direction of the longer diameter to be about N.E. (N.36° E.), and the length of the longer diameter often 1600 miles. In the case of high pressure areas an elliptical form was also found to predominate, the longer diameter being about twice as long as the shorter (ratio 1.91:1), and the direction of trend

about N.E. (N.44° E.). These characteristics also hold, in general, for the cyclonic and anticyclonic areas of Europe. The cyclones of the tropics differ considerably from those of temperate latitudes in being nearly circular in form.

The chief characteristics of a "low," as noted on our weather maps, may be summarized as follows: The spirally inflowing winds turn counter-clockwise in the Northern Hemisphere, and clockwise in the Southern; the wind velocity is generally moderate, being strongest in the southwest quadrant; the pressure varies from 30 inches at the margin to an average of 29.6 inches at the center, although in some cases it may drop to below 28 inches; the temperature is high in the south and east sides of the storm, where the winds blow from a southerly quarter, and low on the west side, where

the winds blow from a northerly quarter; the clouds cover the eastern half of the storm area; the cirrus clouds, which occupy higher levels, extend far out to the east, while the nimbus or rain clouds are located chiefly in the southeast quadrant. The whole area may vary in diameter from a few hundred miles to several thousand miles. In the United States it moves from west to east, at an average hourly rate of 34.2 miles in February, 22.6 miles in August and 28.4 miles for the entire year, according to Loomis.

A "high" area is intimately associated with a "low" area and usually follows it. The chief elements of a "high" are these: The spirally outflowing winds turn clockwise in the Northern Hemisphere and counter-clockwise in the Southern; the wind velocity is usually moderate and decreases toward the center where calms are frequent, especially at night; the pressure varies from about 30 inches at the margin to about 30.6 inches at the center,

although at times it is more than 31 inches; the changes in temperature are great and well marked, being low in the northeast portion, where the winds are from the north, and high in the southwest and west portions, where the winds are from the south; the moisture changes are similar to those of the temperature; few clouds are to be seen and precipitation is usually lacking; the humidity is low in the northeast portion and high in the southwest. Like the "low," the "high" area is from several hundred to several thousand miles in diameter and moves with moderate velocity from west to east.

In the Northern Hemisphere the "low" and "high" areas move eastward and slightly poleward. This is due to the prevailing direction of both the surface winds and the fast upper air currents in these latitudes. They thus drift with the general wind system.

The main track of these storms follows the northern boundary of the United



Photograph by Brown Brothers

A STORM WAVE SEEN FROM A SHIP'S DECK



Illustrations Bureau

Photograph by Brown Brothers

WRECK OF A STEEL SHIP ON THE COAST OF IRELAND

This broken and twisted hulk, resting upon the channeled and wave-swept old rocks of the Irish coast, bears mute evidence of the power of the sea in storm

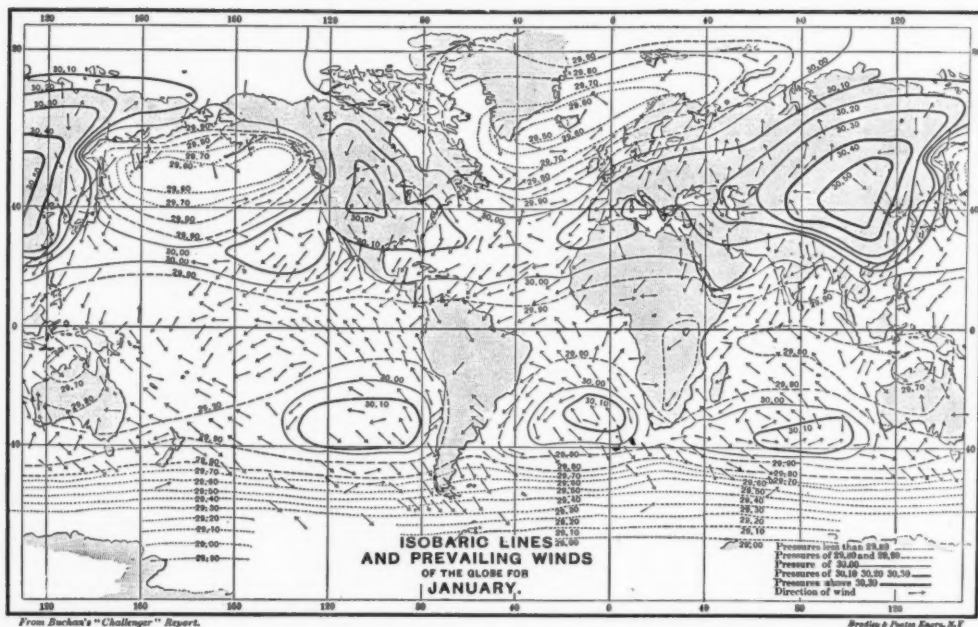
States, across the Great Lakes and out the St. Lawrence valley. The crossing of the United States is made in three to four days. Other tracks from the southwest and south join the main track over the Great Lakes. Still another track comes up the Atlantic coast and joins the main track near Nova Scotia. A second main track is observed by some meteorologists as passing in over southern Oregon and moving southeast across Oklahoma and the eastern Gulf States to the Atlantic coast, where it turns northward or continues out over the ocean.

Another type of storm is the tornado. It is a local whirlwind possessing great energy. In fact, it is a tiny cyclone characterized by very low pressure at its center, and winds of destructive violence over a belt a quarter of a mile in diameter on the average, with a track varying from a few miles to some thirty miles in length. The name is derived from the Spanish and

refers to the twisting or rotating nature of the storm. It usually develops in the southeast quadrant of a "low" which has a V-shaped bulge to the southwest with a crowding of the isotherms and isobars, known as a windshift line. A tornado usually arises two hundred to eight hundred miles south or southeast of the center of a "low" with sultry, moist, southerly winds bearing heavy clouds.

It is always associated with a violent thundershower, which is usually accompanied by hail, a pronounced squall wind, and violent thunder and lightning. It occurs almost exclusively during the warm months of the year, and during the hottest part of the day.

The most invariable feature about a tornado is the peculiar black funnel-shaped cloud which extends downward from the bottom of the heavy cloud masses. The funnel is developed around the axis of a violent ascending vortex of whirling



From Buchan's "Challenger" Report.

Reading & Printing Co., N.Y.

Map by W. M. Davis

Courtesy of Ginn & Co.

CHART SHOWING DISTRIBUTION OF MAIN AREAS OF HIGH AND LOW BAROMETRIC PRESSURE AND PREVAILING WINDS OF THE GLOBE FOR JANUARY. (FROM DAVIS' *Elementary Meteorology*, AFTER BUCHAN.)

winds; its diameter may reach a few hundred feet while the destructive winds around it cover a somewhat greater area. Wherever the funnel touches the earth's surface, it causes complete devastation.

Before the formation of the funnel, the clouds have a black appearance, and seem to be in violent agitation. Then the black funnel appears, which normally drops lower and lower until the surface of the ground is reached. Here it enlarges slightly so that some authors have described the tornado cloud as having the form of a dumb-bell. It may sway from side to side and often writhes and twists. Sometimes it lifts, only to touch the ground again farther on.

In 1902 the writer witnessed, at close range, the development and disappearance of a tornado over Norman, Oklahoma, which did not reach the ground. The V-shaped funnel appeared at the base of the black cloud and dropped about one quarter the distance to the earth, then it

rose into the cloud. This dropping and raising of the funnel was repeated four times before it finally disappeared into the cloud. With each successive drop of the funnel the writhing lower end approached nearer and nearer the buildings of the city, but it did not strike and no damage was done. The storm moved from southwest to northeast and passed over Norman within ten minutes. A tornado may pass a given point in less than half a minute, but this is sufficient for complete destruction.

The destruction is due to two causes:

(1) The excessive wind velocities within the funnel.

(2) The explosive action resulting from the sudden decrease of the barometric pressure induced by the passage of the tornado. The barometric pressure is normally 14.7 pounds per square inch, but when this is suddenly reduced several pounds outside of objects containing air, for example a house, the normal pressure

inside literally raises the roof or forces the windows open, or causes the side walls to fly apart.

Tornadoes perform weird feats: trees may be uprooted, stripped of their branches, or torn off at various elevations above the ground; heavy brick and stone buildings may be demolished; roofs have been torn from buildings and carried long distances through the air; loaded cars and even locomotives have been lifted from the tracks; animals, even babies have been picked up and carried considerable distances, and let down unharmed, while many have been killed. Straws have been driven through boards and fence posts; laths through trees, and small sticks of timber through iron plate. Chickens have been stripped of their feathers, corks have been drawn from empty bottles, circular holes have been dug in the ground, and pictures and furniture have been left intact in houses where one or more outside walls have disappeared.

The noise which accompanies a tornado is tremendous; in fact, it is deafening. The roar is constant and so great that the demolition of buildings is seldom heard. The wind velocity within a tornado has never been measured, but it may amount to five hundred miles per hour in the more violent ones.

Tornadoes are of common occurrence in the Mississippi Valley region and certain of the southern states. They are practically unknown in the Rocky Mountain and Appalachian mountain systems. They are most frequent over the Great Plains and the level country to the eastward. They seldom develop in mountainous or forest-covered areas. About one hundred occur annually in the United States, causing the loss of nearly a hundred lives and several million dollars of property. Tornadoes occur also in the great plains section of southern Canada. As noted by Visser (1925) they are probably as frequent and widespread in Australia as in the United States, and are

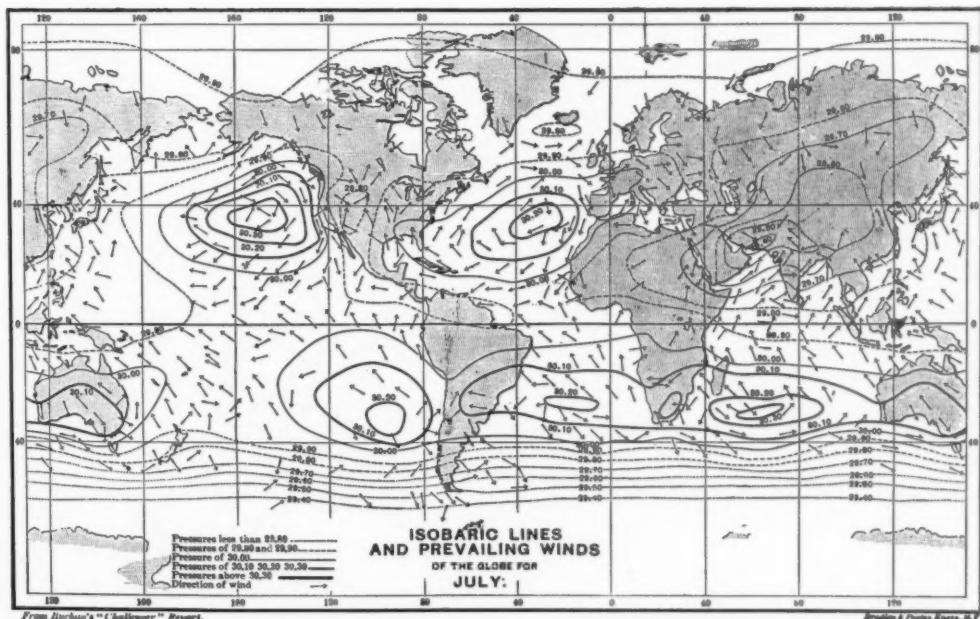


CHART SHOWING DISTRIBUTION OF MAIN AREAS OF HIGH AND LOW BAROMETRIC PRESSURE AND PREVAILING WINDS OF THE GLOBE FOR JULY. (FROM DAVIS' *Elementary Meteorology*, AFTER BUCHAN.)

rather common in western Africa. Typical tornadoes occur occasionally in Europe, in Fiji, and in the Dutch East Indies, China and Japan, and similar storms develop in South America.

Waterspouts are tornadoes that occur at sea or over inland bodies of water. They are most common over the warmer and calmer seas, and may be associated with violent thunderstorms. When the funnel reaches down to the surface of the sea, the water becomes greatly disturbed, and it may rise a number of feet within the funnel. The water in the upper portion of the funnel has been found by observation to be fresh and is a product of condensation from the cloud above.

Waterspouts like tornadoes and hurricanes form true vortices with greater velocity of rotation in the central portion

than on the margin. The vortex tubes are arranged in geometrical ratio and, although packed closer and closer together toward the center, each tube carries the same amount of air upward. They are very destructive near the central axis.

Another type of storm is known as a tropical cyclone which may develop into a hurricane or typhoon. It is similar in many respects to the "lows" or cyclones of middle latitudes. Both are characterized by central areas of low barometric pressure toward which the winds blow more or less spirally; both are accompanied by cloudiness and local precipitation; both move rather slowly in a more or less characteristic direction; both vary greatly in intensity; both occur in all months of the year, but are more frequent and stronger in one season than in another.



P. and A. Photos

**WRECKAGE AT WEST PALM BEACH, FLORIDA, DURING THE
HURRICANE OF SEPTEMBER 16, 1928**

This hurricane, which was first reported by ship radiograms some 600 miles east of the Windward Islands, passed over Porto Rico, the Bahama Islands, Florida, along the Carolina coast to Wilmington, and then northward over Buffalo to James Bay. Immense damage to property and great loss of life were reported from Porto Rico and Florida.



Photograph by Miss Lusille Handberg

Courtesy Wide World Photos

TORNADO PASSING SHERMAN, SOUTH DAKOTA, JULY, 1928

The inclined funnel of this tornado is long and sinuous. It is interesting to note that to the left of the house and directly over it the light and dark bands represent various pressure tubes in the vortex of this terrible phenomenon. Below the constricted central portion the wind blows spirally inward and upward; above, spirally upward and outward, forming the bulge at the upper end

Some tropical cyclones cause merely slight changes in the weather; others are accompanied by strong winds; still others by gales; and a lesser number by winds of hurricane force.

Tropical cyclones, however, differ from the "lows" of middle and high altitudes in several respects. On the average they are more intense and gales are common. They usually move westward or northward and out of the tropics, while mid-latitude cyclones practically never move westward nor into the tropics. Tropical cyclones are smaller, averaging about three hundred to four hundred miles across. They also move more slowly, their average rate being about three hundred miles a day, although some move one hundred miles a day and a few four hundred to five hundred miles. Another difference is that tropical cyclones have

an "eye"—a calm central area with a diameter of ten to twenty miles. Few cyclones of mid-latitudes have an "eye."

Tropical cyclones differ from tornadoes in that few tornadoes are destructive over a belt wider than a quarter of a mile and longer than thirty miles, while hurricanes and typhoons may cause great damage throughout a belt several hundred miles wide and a thousand miles long. Instead of twisting off trees and demolishing buildings as the well developed tornado does, a hurricane usually uproots a few trees, breaks off branches and strips off the leaves, and generally demolishes only the less substantial houses. Tornadoes are most frequent in spring and early summer; tropical cyclones may occur every month of the year, although most of them develop during the summer and autumn.

Although the most striking characteristic of tropical cyclones is the strong winds spiralling toward the center, the destructiveness of these storms is only in part due to the winds. Waves produced by the wind engulf boats, break them or drive them upon the shore, and may do great damage upon low-lying coasts.

Wall-like waves five or ten feet in height, advancing far up the streams, may drown people far from the sea. The destructiveness of the waves along the shores is greatly increased by the rise in the sea itself, which occurs near the center of the storm, due both to the wind-driven water of the inrolling waves, and, in a lesser degree, to the partial vacuum at the center. In fact, the sea itself is sometimes raised more than ten feet, and waves reach heights of twenty feet or more above normal sea level. A striking example occurred during a typhoon at Mille, latitude 8° N. in the Marshall Islands, June 30, 1905, when

waves rose forty-six feet above sea level. Low-lying lands have repeatedly been overswept by hurricane waves. Reports indicate that the only surviving residents of certain low islands were persons who had climbed palm trees and tied themselves there. The late Jack London in one of his South Sea tales, *The House of Mapuhi*, describes vividly the development of a hurricane and its sweep over low-lying islands peopled with pearl-diving fisher folk.

Visher (1925) notes that when the barometric pressure at the center of a hurricane is less than twenty-eight inches, the sea level is raised about two feet. Consequently, when the center of a hurricane strikes a low coast at the time a high tide is coming in, the effect of the waves is intensified.

Another cause of destruction by tropical cyclones is the downpour of rain commonly associated with these storms. As much as twenty inches of rain may fall in a day or two, while the storm is passing. As a result, small streams swell into dangerous torrents, and much low-lying land is flooded, causing the death and impoverishment of many people.

Tropical cyclones develop in the doldrums, usually within latitudes 10° to 25° north and south of the equator. Those in the Northern Hemisphere move northwest through the trade-wind belt with a velocity varying from six to twelve miles an hour. They curve to

the right in about 28° to 30° north latitude and move north or northeast through the region of the prevailing westerlies. As they move forward, they grow somewhat larger and the velocity of motion rises to twenty, thirty, or sometimes forty miles per hour. A few excerpts from ship logs give a faint idea of the power of the sea in a tropical storm.

On August 23, 1913, the American four-masted schooner, "Robert Searles," encountered a storm one thousand miles southwest of Mazatlan,



P. & A. Photos

A CLUB-SHAPED TORNADO SWEEPING ACROSS THE PLAINS NEAR CHEYENNE, WYOMING

The dust-whirls about the dark, bulging, lower end of this tornado are noticeable, while a short distance away the air is apparently calm. This scene is unusual in that the smallest diameter of the funnel is at the base of the dark cloud

Mexico. At 2:00 A.M. of the 24th the glass began dropping; all hands started to shorten sail. The storm came on rapidly and at 6:00 A.M. the foresail was blown away. Other sails followed; and at 10:10 A.M. the forestay sails went by the board, leaving the vessel to go broadside to the sea. Heavy waves swept the schooner and, shortly after, the rail davits and Captain Sandberg were washed overboard. Before 5:00 P.M., when the gale moderated, the deck load of lumber, the rudder, all sails, and the fore and main masts had disappeared.

An account by Paul R. Wright of the U. S. Transport "Sherman" gives a vivid picture of a typhoon in the China Sea, September 1, 1919.

At daylight I was privileged to behold one of the wildest and most sublime scenes that men have ever looked upon and lived to tell about. The storm was at its height. The wind was coming in gusts that reached 120 miles an hour. The air was simply filled with the white spume of the sea, just as the air is filled with snow in a great storm at home. To windward it was impossible to see more than one hundred feet, and to leeward not much farther. Yet through this white welter we could see something of the heights and depths that hemmed us in more than masthead high, with writhing slopes like the sides of mountains.

The wind pitched itself at us with a force that made the gale of the night before seem puny and ineffective. Altogether it was an exhibition of violence unsurpassed. The nearest approach to it is afforded by Niagara Falls, as you ride up to the foot of the tumbling waters in the "Maid of the Mist," or walk under them to the "Cave of the Winds." But here both air and water were like a Niagara let loose and driving themselves down upon our little steel ship. Against the un-

protected face the hard driven spume stung like the flying particles of a sandstorm. It was terrible and magnificent. At eight o'clock the barometer reached its lowest mark and stood at 28.58. From this point the mercury rose steadily and the wind tended to abate. The humming reverberation of the ship under the pounding seas gradually lessened and the general strain was relieved before nightfall.

The regions chiefly subject to tropical cyclones are:

- (1) The West Indies, the Gulf of Mexico, and the coast of Florida.
- (2) The eastern north Pacific.
- (3) Central north Pacific.
- (4) Western north Pacific.



Wide World Photos

TORNADO AT VULCAN, ALBERTA

The dark vertical funnel of this tornado is dumb-bell-shaped, with its smallest diameter a short distance below the mass of dark, seething clouds. It was so dark overhead that objects on the surface of the ground appeared in silhouette against the gray sunlit sky beneath the storm

- (5) Western south Pacific.
- (6) Australian region.
- (7) South Indian Ocean.
- (8) Arabian Sea.
- (9) Bay of Bengal.

The total annual number of tropical storms occurring in these regions as noted by Visser (1925) are as follows:

Cyclonic disturbances.....	74
Lesser hurricanes and cyclones.....	60
Hurricanes.....	39

The characteristics of various types of storms, their rate of movement, occurrence, and the paths which they follow, have been noted in previous pages. A brief discussion of matters of more general import follows:

Two hypotheses have been advanced to explain the manner of origin of tropical cyclones, namely: the mechanical and the convectional. The first and older theory holds that these whirling storms are set

up by friction between opposing currents of air. The opposite conception treats of the conveyance of heat from one atmospheric region to another by currents of air and water due to their specific capacities for heat, or, by the freeing of the latent heat of vaporization when the aqueous vapor condenses. The mechanical view was proposed about one hundred years ago, the convectional in 1841. Each hypothesis has been supported by eminent meteorologists, and modifications have been made on both sides to meet the increase in knowledge. Some meteorologists even hold that both agencies contribute to the formation of these storms.

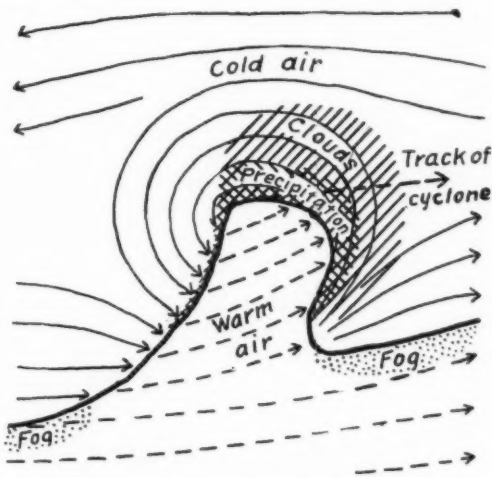
An important relation exists between the "low" and "high" areas of barometric pressure, which cross the United States from west to east in three to four days, and the larger pressure areas or "centers of action" known as the Aleutian and Ice-



A 1901 TORNADO ABOVE NORTON, KANSAS

P. & A. Photos

Another unusual photograph, showing two funnels, one above the other. The lower one is more or less transparent and partakes of the nature of a dust-laden whirlwind. The upper dark cone, just appearing, is filled with condensed vapor. Both cones united before the storm was over

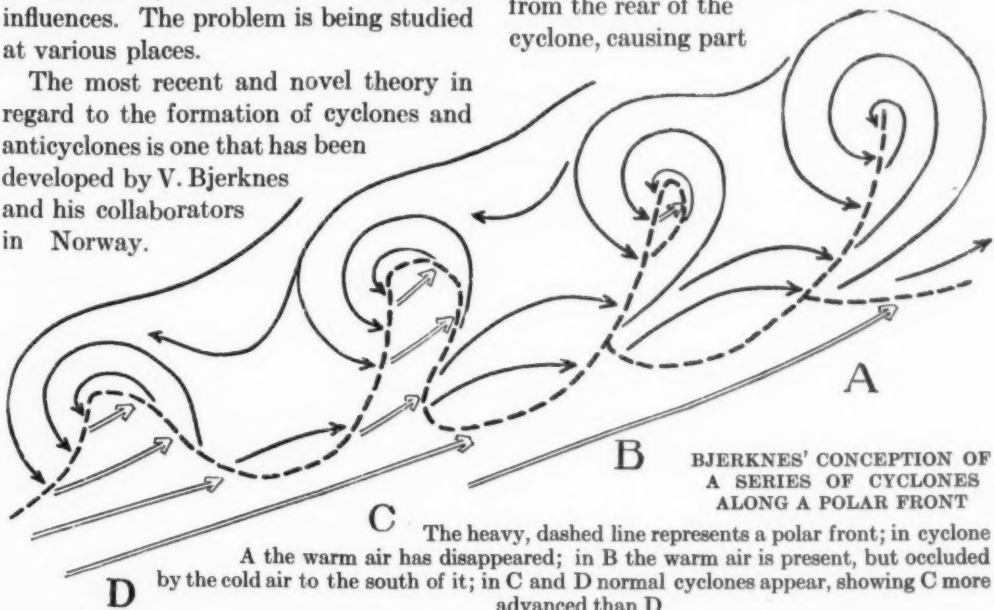


Plan of the relations of warm and cold air currents in a cyclonic storm. (After Bjerknes)

land lows, the "highs" over the mid-latitudes of the Atlantic and Pacific oceans and, in the winter months, the "highs" over Siberia and North America. When the pressure in these larger areas is abnormal, marked differences arise in the normal weather, and in the temperature conditions in the United States. Some meteorologists assume that these abnormal distributions of pressure are due to extra-terrestrial, and others to terrestrial influences. The problem is being studied at various places.

The most recent and novel theory in regard to the formation of cyclones and anticyclones is one that has been developed by V. Bjerknes and his collaborators in Norway.

From a study of detailed weather charts he developed the idea that the air strata of different density, most frequently met in nature, are the two great currents, one flowing toward the pole, the other toward the equator. The accompanying drawing, after Bjerknes, shows how these currents act and react to form a cyclone. Here we see that the cyclone consists of two essentially different masses of air, one of cold, the other of warm origin. They are separated by a fairly distinct boundary surface, which runs through the cyclone and which has been designated the line of discontinuity, or polar front line. The whole system propagates with the east-bound current of westerly winds and the cyclonic center with the lowest pressure area. In the Northern Hemisphere the warm air is conveyed by a southwesterly to a southeasterly current on the southern or eastern side of the depression. At the front of this current the warm air ascends the wedge of colder air and gives rise to precipitation in the form of warm front rain. At the same time the warm current is attacked on its flank by cold air masses from the rear of the cyclone, causing part



BJERKNES' CONCEPTION OF A SERIES OF CYCLONES ALONG A POLAR FRONT

The heavy, dashed line represents a polar front; in cyclone A the warm air has disappeared; in B the warm air is present, but occluded by the cold air to the south of it; in C and D normal cyclones appear, showing C more advanced than D

of the warm air to be lifted and precipitation formed as a cold front rain.

Bjerknes has found that the line of discontinuity continues outside the limits of a single cyclone, and that it passes from one cyclone to another. The single cyclone described above thus represents only one stage in the development of the life cycle of a cyclone. Bjerknes has published a series of sketches showing the "life cycle" of cyclones, the formation of a secondary cyclone as a wave on the cold front of the primary cyclone, cyclone families, etc. The series of changes in a cyclone along a polar front are schematically shown in the figure on page 603 by sketches A. B. C. D. He observes that during the first phase of the development of the cyclone, from its origin to the moment of occlusion, that is, when the cold air on the ground in the front and rear of the cyclone join, the warm is lifted by the two wedges of cold air as they gradually approach each other. After the two wedges of cold air have met on the ground, the still existing upper warm sector will be further lifted and gradually cooled to the temperature of the surrounding air, causing the cyclone to fill up or disappear. Before one cyclone is occluded, others begin to form to the westward.

On sufficiently detailed weather maps a series of connected cyclones may be observed in temperate latitudes forming a circumpolar whorl. It has also been observed that when the polar air from the rear of one cyclone enters the trade wind belt, the next series of cyclones will appear on a more northerly track and follow a new polar front, which is not connected with the previous one. This periodicity enables us to divide cyclones into groups which have been called cyclone families.

In the opinion of some meteorologists, the theory which has been advanced by Bjerknes at the Bergen Institute in Norway since 1918, represents a decided step in advance. The theory, however, cannot be fully tested under existing conditions of weather reporting. What is required is the establishment of a larger

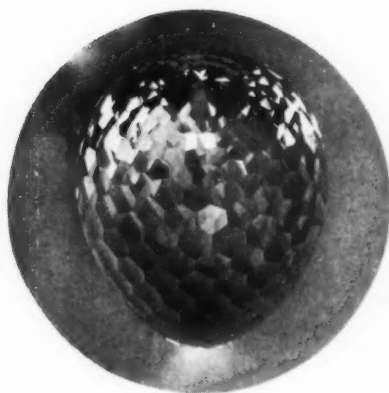
number of observation stations throughout the Northern and Southern Hemispheres, and the development of a more intensive charting of daily weather conditions at the central meteorological stations. With the proposed increased facilities in operation, there would arise a more accurate forecasting of the weather, and a more precise knowledge concerning the origin, development, and movement of storms.



A VIOLENT TORNADO SWEEPING ACROSS THE PRAIRIES NEAR OKLAHOMA CITY, OKLAHOMA

This remarkable photograph was made at a distance of two miles from the approaching tornado. It is an unusual view, because the funnel is short and thick and the black cloud descends near to the surface of the ground

Wide
World Photos



A BLUE TOPAZ

WHAT IS A GEM?

What Qualities Make Some Stones Precious? Why are Diamonds, Rubies, Emeralds, Sapphires, and Others the Culmination of All That Is Fine in Stones?

By HERBERT P. WHITLOCK

Curator of Minerals and Gems, American Museum of Natural History

THE relation of minerals to gems is not always easy for the layman to grasp. If every different kind of mineral furnished a different kind of gem, there would be more than one thousand varieties for the jeweler to remember. In point of fact, only four per cent of the mineral species known to science are suitable for the fashioning of gems. Moreover, in many instances only certain varieties of a particular mineral answer the requirements of a gem stone.

Let us then consider briefly the qualifications which combine to confer nobility, as it were, on the members of the mineral family, because in most cases our most beautiful and precious gems are only distinguished varieties of very common and unassuming minerals.

In the first place, the most obvious quality that a gem should possess is beauty of color. From the rich brilliant red of the ruby through the delicate and subtle shades of tourmaline and chrysoberyl, beauty of color is the source of the appeal exercised by these fragments of Mother Earth.

Linked to beauty of color is a second

quality which in most cases determines the question of whether a mineral will qualify as a gem. A certain degree of transparency which permits the color qualities of a gem to be developed by the cutting and polishing of the stone, is a necessary requirement of most gem minerals.

Again, in order to preserve its transparency and polish against the wear to which a stone worn as jewelry is inevitably subjected, a gem mineral should possess a certain degree of hardness. This requirement is particularly rigid for stones that are intended to be mounted in rings, since it is these that are subject to the most strenuous wear.

And, lastly, the desirability of a gem is very largely governed by its rarity. We have ample illustration of this in the single case of the artificially produced sapphires and rubies, which, although possessing all the qualities of the choicest natural gems, beauty of color, hardness, brilliancy, are on account of the ease which they are obtained and their attendant low price, little esteemed among the wearers of gems. Nor does the comparatively low price of these artificial members of the

royal family among gems in any way affect that of the natural rubies and sapphires. Gem purchasers are willing to pay many times the value of a synthetic gem solely for the rarity of the same gem from a natural source.

To sum up, then, the qualifications which determine whether a certain mineral or a special variety of a mineral will furnish material for gem stones, we have:

1. Beauty of color
2. In most instances transparency
3. A certain degree of hardness
4. Rarity of occurrence under these conditions

Just what is the difference between a precious and semiprecious stone? This question is very often asked and is not altogether easy to answer. The difference, although mainly one of value, is complicated by several considerations. In the first place, a gem mineral such as beryl furnishes us with the highly desir-

able gem, the emerald, and also with the semiprecious aquamarine. The same is true of all the mineral species that include among their varieties the precious stones, the single exception being the diamond; there are no semiprecious diamonds.

Again, a gem stone that today commands a price which places it in the precious stone class, may in ten years dwindle in value to a point where it becomes a semiprecious gem.

Today the precious stones include diamond, ruby, sapphire, emerald, and opal, although, on a basis of value, such gems as alexandrite should be classed as precious. Of these favored few among the gems, both ruby and sapphire are varieties of the same mineral, corundum. In other words, a deep red corundum is a ruby, and a fine, rich, blue corundum is a sapphire.

But here again we come to distinctions



Underwood & Underwood

WASHING DIAMONDS FROM RIVER GRAVEL IN BAHIA, BRAZIL

A wooden bowl, shaped like an old-fashioned chopping bowl, is this Brazilian's only utensil. With a rotary motion he carefully separates clay and silt from the small pebbles, and picks out the diamonds from among the latter

*Underwood & Underwood***RUBY MINES NEAR MAGOK, UPPER BURMA**

The world's supply of fine rubies comes almost exclusively from this little corner of the Far East "on the road to Mandalay"

and differences. A good judge of gems will tell us that he can distinguish between a Burma and a Siam ruby by the color alone, and that he can note the shade that separates the rare Kashmir sapphire from its less expensive sisters who hail from Ceylon and Montana.

Then there are those usurpers of privilege, the artificial rubies and sapphires, who do not own Dame Nature as their parent at all, and are consequently, on a basis of value, very much semiprecious stones, although they are just as much real rubies and sapphires as those dug from the earth.

The mineral beryl gives us among its gem varieties the emerald, which just now stands supreme among precious stones, and the aquamarine, a sort of poor relation to it, ranking as a semiprecious stone. Here again there are elusive shades of difference in color between the so-called Peruvian emeralds, which really

come from Muzo in Colombia, and the Siberian emeralds, some of which constitute the chief glory of the Russian crown jewels.

There are few people who realize how much difference exists between the various shades of color in the aquamarine. This semiprecious gem runs the gamut of color between greenish blue and greenish yellow, as is shown in the magnificent series in the Morgan Gem Collection. Here one may see large choice stones from Siberia, Brazil, Ceylon, and, not least among them, our own United States.

Then there is that rainbow-like gem, the opal, that occupies a somewhat analogous place between the precious and semiprecious stones, sometimes being ranked with one group and sometimes with the other. There are few of us, however, who can resist the charm of the richly colored black opals from Australia, or the harlequin-like fires of those from

Hungary, and despite its evil reputation as a harbinger of ill fortune, the opal will always hold a high place among those of us who appreciate its many-colored beauty.

Among the large family of the semiprecious stones, the wearer and admirer of gems may satisfy his (or much more probably her) love of the beautiful, quite apart from the artificial prestige that goes with the possession of something of supreme value. Stripped of the sentiment of expensiveness, a sentiment which actually has its root in barbaric splendor, many of these scraps of frozen color may well rival in beauty the emerald or the sapphire. And how little we know about them! Not one person in fifty knows that there are several kinds of garnets, or that such a gem as the peridot is in existence.

Since the very general custom of wear-

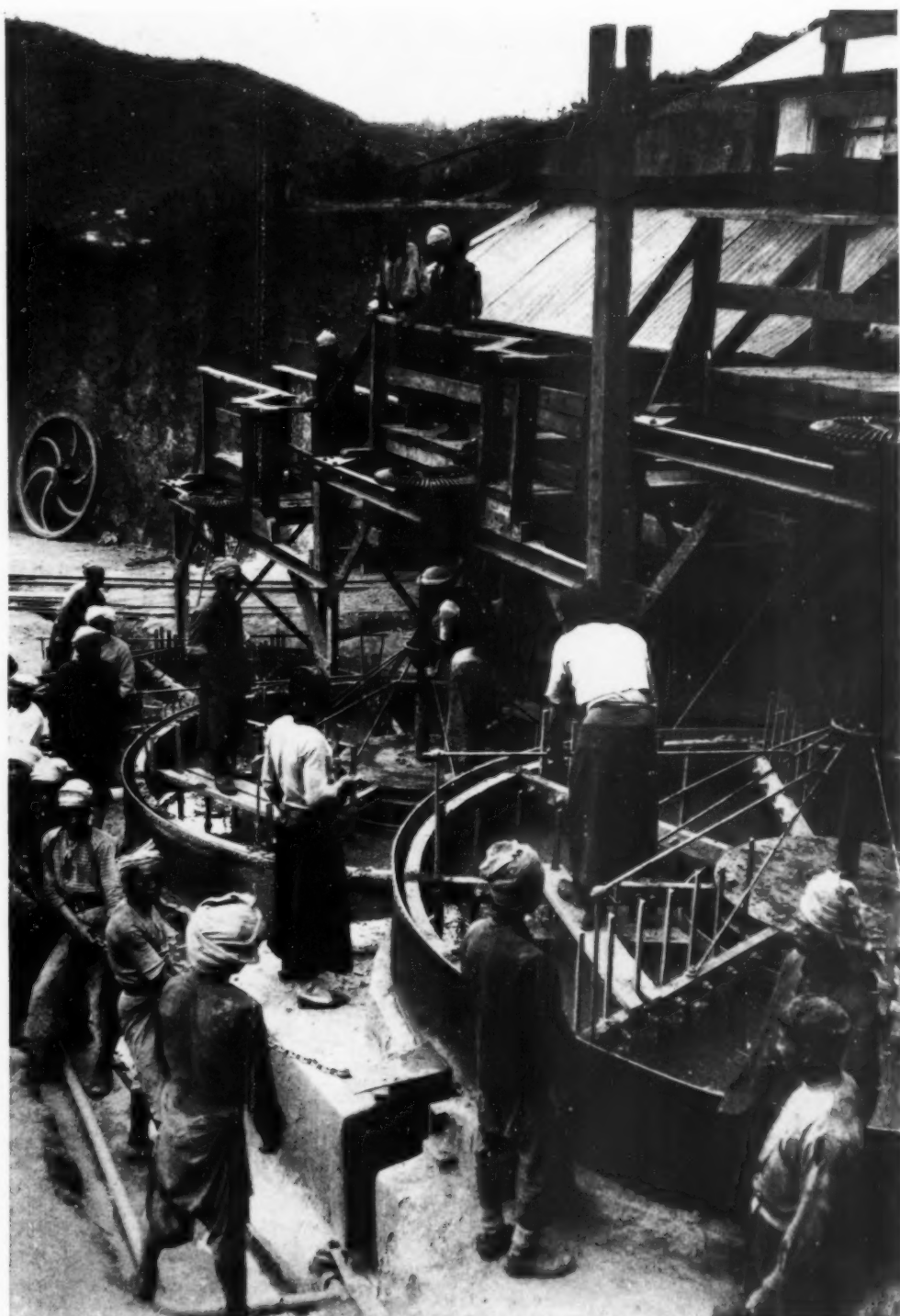
ing strings of beads has been revived among women, I say *revived* advisedly because beads are the oldest and most universal of all jewelry forms, the semiprecious gem stones are coming into a well deserved popularity. People are awakening to the charm of the tawny fire that lives in the heart of the topaz, and to the changeful delicacy of the tourmaline. They are finding out there is a great deal to learn about the semiprecious stones. The average jeweler of thirty years ago was content to know his diamonds, sapphires, rubies, and emeralds, and I have even encountered one in those days who spoke of every stone other than these as a "fancy sapphire." But we have arrived at a time when semiprecious stones are sold in the department stores, and by people who decidedly know what they are dealing in.



Underwood and Underwood

SORTING RUBIES FROM THE RIVER GRAVEL

A handful of pebbles from these river gravels, near Magok, Upper Burma, shows all the colors of the rainbow, and among them there is always the possibility of finding a valuable "pigeon's blood" ruby in the rough. These deposits are known to be of great antiquity, and the sorting of them for rubies and other gem stones has been carried on through many generations



Underwood & Underwood

WASHING PLANT OF THE BURMA RUBY MINING COMPANY

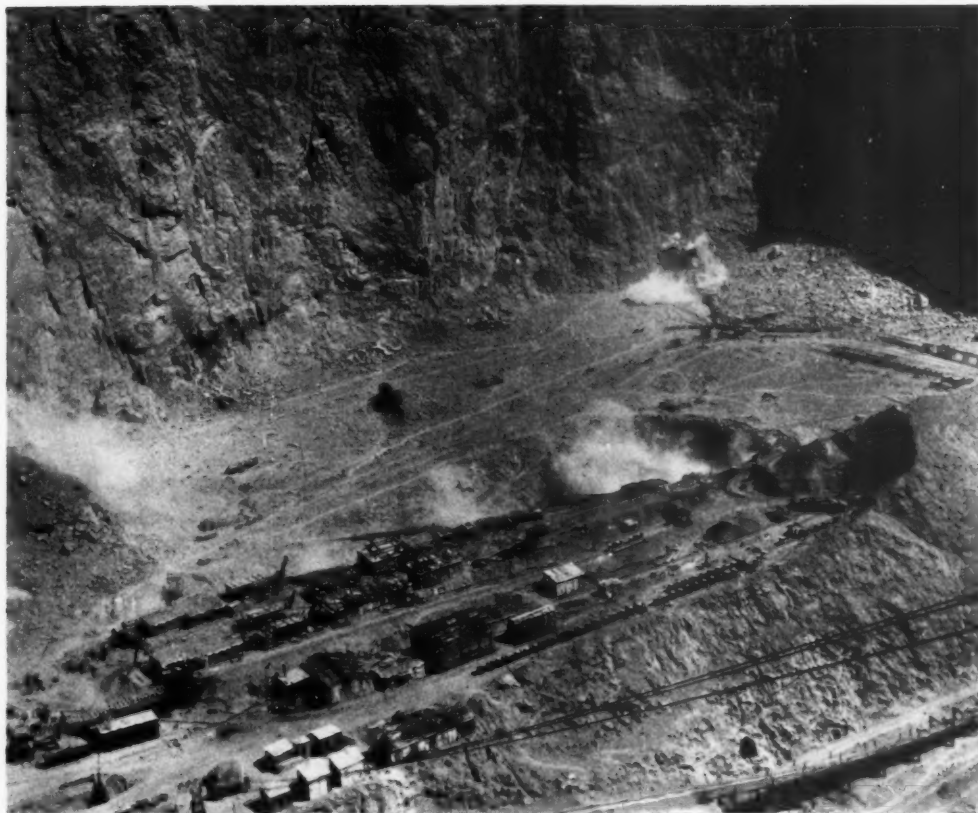
Even in far-away Magok life is not as simple as it formerly was. These mechanical devices for washing the ruby gravel have replaced the primitive methods of bygone years



Underwood & Underwood

PRIMITIVE METHOD OF WASHING THE RUBY-LADEN GRAVEL

Where labor was cheap and manual skill highly developed, the workman was still a major factor, as in these Magok ruby mines, where natives washed and picked over the gem gravel by hand



Copyright by De Cou, from Ewing Galloway

DIAMOND MINING IN SOUTH AFRICA

In this view of the Premier Diamond Mines at Pretoria, we see the bottom of the huge hole representing the excavated portion of the crater or "neck" of an ancient volcano. The rock which completely filled this volcanic vent contains the diamonds. It was from this mine in 1905 that the world's largest diamond "the Cullinan" was taken

The day has gone by when all yellow stones were considered as topazes, and we are also learning to disbelieve the comfortable fallacy that all topazes are yellow. The many yellow stones that grace the counters of the up-to-date jeweler have subtle differences in shade which we are beginning to recognize, just as we are awakening to the knowledge of blue and white and orange as well as yellow topazes. It seems safe to prophesy that, as more people gain more knowledge regarding the possibilities of the less well-known semiprecious stones, such as zircon and peridot, alexandrite and kunzite, we shall see these gems come into far more general use.

The objection to the semiprecious stones, which has descended to us from the Victorian period when gems were largely set in rings and bracelets, is that they are for the most part too soft to stand the constant wear to which a piece of jewelry is subjected. Now this certainly does not apply to most of the modern jewelry forms, which from their character would be submitted to very little abrasion, and for which a stone as hard as a garnet would seem to be almost as well fitted as one more resistant to wear.

There is probably no single substance on earth that is so obvious from the point of view of the student of minerals as quartz. It is to be found in all sorts



NATIVES CUTTING RUBIES IN BURMA

In this Burmese lapidary shop progress has substituted for the primitive method seen in the lower picture quite a modern gem-cutting wheel or "lap," operated by foot power. Here the rough ruby pebbles are being covered with angular faces or facets and emerge as "native cut stones"

Underwood & Underwood

CEYLON GEM CUTTER AT WORK

The method of this native gem cutter reduces the implements of his craft to a minimum. The wheel which does the cutting is rotated by a kind of bow-string wrapped around a drum. The stone is held in his left hand

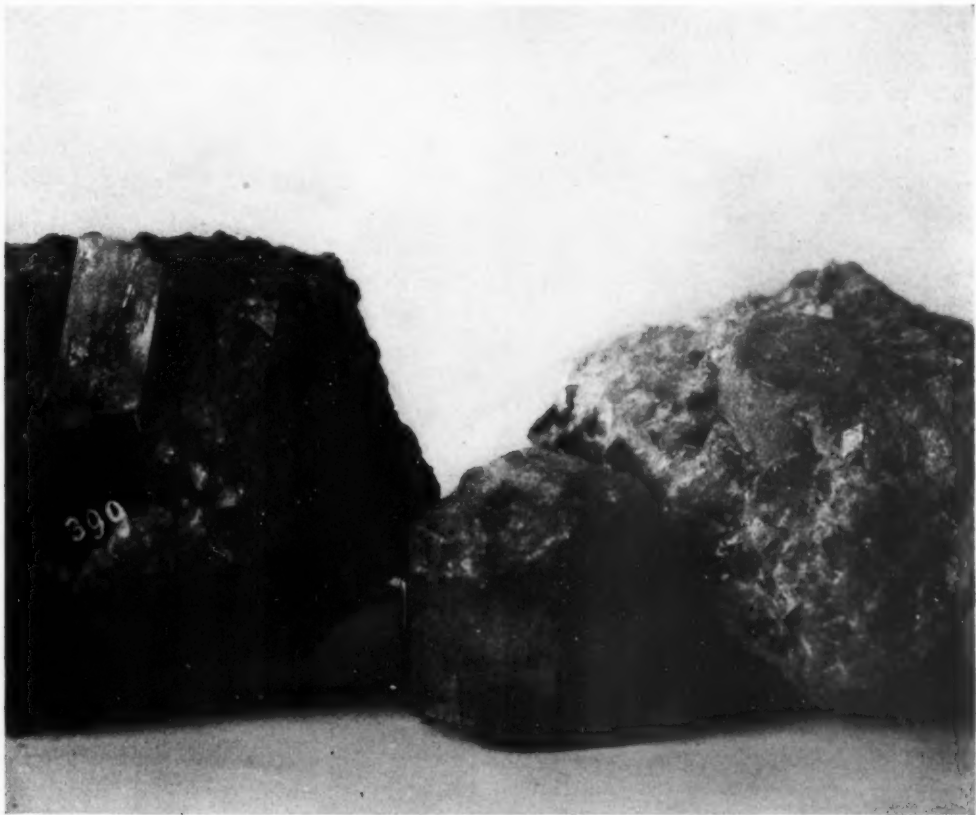


*Photograph from The American Gem
and Pearl Company*

of places, and in all kinds of rocks, from the grain of sand on the beach to the rock formation on the mountain-side. Because quartz is so universally present under such varying conditions, it is not at all strange that we should find in it an almost endless variety of phases. To be sure, as gem stones, these varieties of quartz are not, generally speaking, valuable. They constitute the stones that are priced by the pennyweight rather than by the carat. For this very reason, however, they hold a unique place in the scale of gem values as the materials out of which we may fashion such jewelry as beads, as well as the host of small art objects that are usually decorated with engraving and carving.

There are also, of course, the varieties that are cut into the faceted stones so dear to the hearts of our grandmothers: amethyst, cairngorm, and citrine or false topaz. Generally speaking, however, the quartz gems, or perhaps more properly the quartz stones, are to be found rather in the antique shops and the art auction than in the jewelry store. Some of these are quite the reverse of cheap as, for example, the rock crystal spheres that are so cleverly made by the Japanese, and which now command quite remarkable prices for such a plebeian mineral as quartz.

If you are interested in Oriental art objects, you will find among the things carved out of rock crystal, vases, boxes,



COLOMBIAN EMERALDS IN MATRIX

These emerald crystals from the old mines at Muzo, Colombia, have sometimes been called Peruvian emeralds, because of the veneration with which they were regarded by the pre-Spanish aborigines of that country

and snuff bottles, the work of Chinese lapidary artists. The Imperial Lapidary Works at Ekaterinburg in the eastern Ural Mountains, which, previous to the revolution flourished as a center for the production of Russian carved objects, has turned out some very fine examples of work done in several varieties of quartz. Prominent among these are the rock crystal vases, coupes, and seals, many of these designs being also reproduced in a dark green jasper, characteristic of the Urals.

One may find among the quartz varieties every degree of transparency and almost every shade of color: the satiny sheen of the tiger's eye, and the intricate pattern of the moss agate, the rich purple of the amethyst, and the delicate milky pink of rose quartz.

Few of us are willing to admit that for jewelry purposes a gem stone can be anything but transparent or at least translucent, and yet there are at least two well-known materials of the jeweler's stock in trade that are distinctly opaque, turquoise and lapis lazuli. There are as well a great many less known members of the family of opaque stones that are slowly but surely winning their way into popular esteem, particularly along the lines of modern jewelry. One of the most striking examples of this is, of course, the little group of minerals that go by the name of jade.

It is a strange and very significant fact that all three of the opaque stones we have called to mind have been used for jewelry purposes since extremely ancient times. There are Babylonian cylinders carved from lapis lazuli and engraved with texts that show them to be six thousand years old. There are marvelous inlaid ornaments made of mosaic-like patterns of turquoise that go back to the time when old Egypt was young, and any one who has dipped into the lore of jade will realize how vital a part it has played in the culture of China.

Then there are the stones that we do not know so well, the rich mottled green malachite of Russia, that seems to sound the note of barbaric splendor of the old regime; and its compatriot rhodonite, of an old rose color, that is so much in evidence among any group of Russian carved objects. The apple-green amazon stone also deserves a much more important place among the materials of art jewelry than has been accorded to it.

In this same category we must include the opalescent stones, such as the moonstone which comes from Ceylon, and which seems to bring with it a ray of oriental moonlight. Nearer home we have the labradorite from the Island of St. John off the Labrador coast. This stone seems gray and uninteresting until it catches a glancing ray of light, when it develops the blues and greens of a peacock's feather, varied with fine orange and tawny yellow, a truly surprising performance. Yet I dare say that those of us who have never ventured as far as Labrador have never heard of it.

Of all the varied forms in which gems have been combined in jewelry the necklace is without question the most ancient. From the crude haphazard assemblage of gem pebbles such as primitive man was able to pierce, string together, and hang around his neck, to the most elaborate creations of modern jewelry, we are able to follow in almost unbroken sequence the evolution of the necklace throughout the ages, and in most of the countries of the ancient world.

The oldest civilizations of which we have any knowledge began in their infancy to use gem stones for beads. Earlier than the cuneiform inscribed cylinders of Assyria were the roughly shaped beads that are only now coming to light from recent excavations at Ur. Earlier than the scarabs of Egypt were the charmingly barbaric necklace beads, pendants, and amulets of the first Egyptian dynasty.



Photograph from Ewing Galloway, N. Y.

SAWING ROUGH DIAMONDS IN AMSTERDAM

As one of the first steps in the production of polished diamonds from rough crystals, each of these little circular saws is biting its way through a diamond, charged on the edges with diamond dust, because only diamond can cut diamond. The function of the wheels is to produce, with the smallest amount of waste, pieces of convenient shape to be faceted

And earlier than the quaint engraved Moslem amulets of Persia were the rough lapis lazuli beads whose glory resides in their rich ultramarine color.

The Franks of the Merovingian epoch used agate, jasper, carnelian, and rock crystal beads. These somewhat barbaric necklaces, the heavier of which were probably worn by men, have been recovered from Gallo-Roman graves of the Third and Fourth Centuries, and possess a certain unique beauty and delicacy of color that appeal strongly to our present standards of taste.

Of course, in these, the most elementary of jewelry forms, no attempt at was made setting the stone in metal. The lapidary of that early day was content to drill a hole, not always a very satisfactory one, through his gem-stone bead, string it along with others of its kind, and negotiate it through the current medium of exchange in the manner which is, if possible, older than jewelry itself. But, from a necklace composed of strung beads, it is not a long step to one in which the roughly shaped stones were encased in a gold setting conforming to the irregularities in the shape of the stone, and capable of being strung or suspended from a string as an unset bead would be.

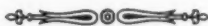
Sometimes a stone which had been shaped, pierced, and *actually used as a bead*, was, at some later stage in its history, set in metal by a worker of a more advanced culture. A good example of this is to be found in the sapphires that adorn the crowns of the Visigoth Kings in the

Chuny Museum in Paris. Many of these show the unmistakable shadow of the hole that was drilled through the stone when it was, in an earlier jewelry form, used as a bead. The same is true of the aquamarines that constitute the principal gems of the ceremonial necklace of a Moroccan vizier, in the Morgan Collection of Gems.

If one were to speculate on the history of these gems, an almost boundless field for the imagination is opened up, for it is quite obvious that they have had a history, and in all probability an interesting one.

We know that most of the famous diamonds of the world have had historic careers, involving violence, cupidity, and intrigue. It would be interesting indeed if it were possible for us to write the story of every gem in a jeweler's showcase. Some of them may have been mined only last year, but others may have seen centuries of use as gems. Cut and recut to conform to newer styles in gem cutting, but never losing their identity, they are never destroyed, they never wear out or decay. Even when buried, they are subsequently dug up only to continue their career, inciting future generations to love and hate, greed and murder, as they have incited those of the past.

Gold and silver objects are constantly being melted and shaped into newer forms, but a gem can never lose its individuality. A ruby is always a ruby or an emerald is always an emerald, they can never be anything else.



HOW OUR CHRISTMAS CUSTOMS CAME

The Pagan and Christian Sources from which Have Sprung the Numerous Practices that Make Up Modern Christmas

By FRIDA DAVIDSON

MODERN Christmas has its two aspects of the merry season and of the holy time fairly well blended, for the second gives sanction to the first, even though the first overshadows the second in actual life. The Infant Saviour is the accredited cause and origin of the festival as it was built around him by the Church and hallowed by tradition and age-long faith; but modern usage plus commercial enterprise have pushed the more robust figure of Santa Claus well into the foreground. He sets the pace for us and we follow his merry, though sometimes breathless, lead with a vague feeling that there is, after all, some connection with the birth two thousand years ago of the Holy Infant in Bethlehem.

Because the beauty and sentiment of the Nativity story form its greatest value, it figures not at all at this point that the date of Jesus' birth has never been determined with accuracy. Indeed, it has been attributed at various times to every month in the year according to the source of information considered. The Gospels, of course, give no date. Ancient Oriental records list a notice that is only historic in

intention and separate from the Church calendar, of the birth of Jesus on December twenty-fifth; but, as the date of his carnal birth, this was not for religious worship. It was rather the manifestation of his glory and divinity that the Church chose to celebrate on January sixth, combining the Nativity, the Epiphany, and the Baptism in one time of worship.

Parallel to this ecclesiastical Christian holy-day, the existence of pagan folk-

festivals, such as the Yule and the Druid rites, has been generally recognized. The ancient Bede mentions a pre-Christian festival of the people of Anglia on December 25, called "Modranecht," mother's night. Few observers of Christmas, however, are aware of the significant relation to it of the sun in its phase of the winter solstice. We remember primitive man and his growing fear when the days became shorter and

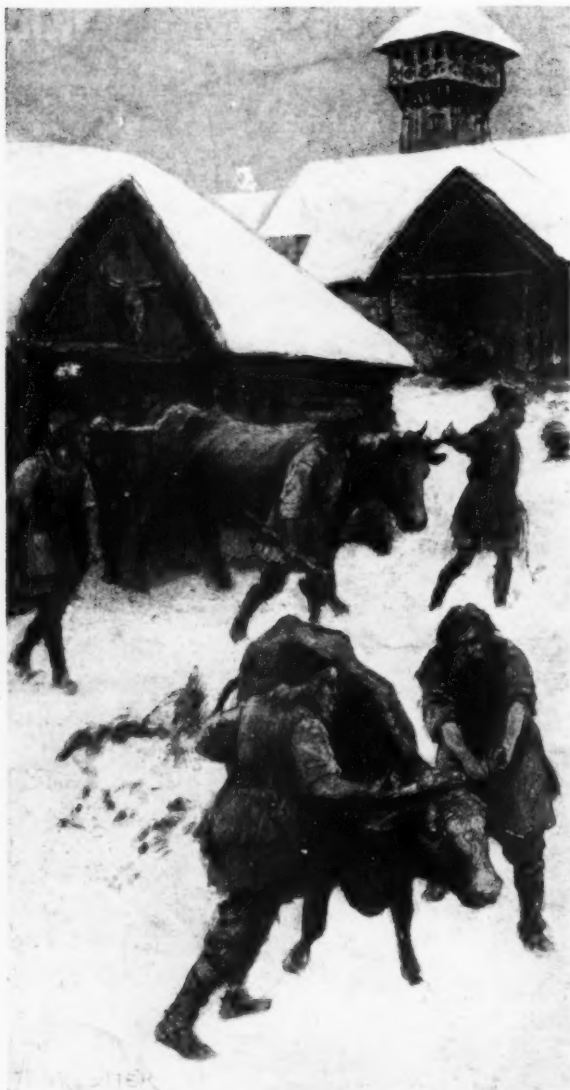
the cold increased; how he appealed with prayer, and burned sacrificial fires to appease the angered sun god. The sun paused in his path as if to listen; then no doubt pleased by the attentions, was prevailed upon to return and lengthen his daily stay. Great rejoicings, and



Courtesy N. Y. Public Library

DECORATING A ROMAN VILLA IN LONDON, FIFTH CENTURY

Sacramental cults in connection with the plant world originated in pre-Christian times. Adorning houses with evergreens at the January Kalends or New Year's Day was a common practice in the Roman Empire



Courtesy N. Y. Public Library

**SAXONS LEADING OXEN TO SLAUGHTER,
FIFTH CENTURY**

The custom of slaughtering animals for the midwinter solstice festival probably had a sacrificial or sacramental origin. "Yule Doughs," the little images made of paste, presented by bakers to their customers at this season, may, when in human or animal form, have taken the place of actual sacrificial victims

more fires. Those altar-fires are connected in unbroken sequence with our Twentieth Century Christmas, one might almost say that our Christmas-tree candles were lighted at their blaze. Everywhere the universal act of worship

on every altar, in every age,—mystic, symbolic, æsthetic, accessible—has been the sacred flame, the fire that could reach its smoky fingers to the God above, the light that repeated in small compass the image of His greatness, for it is the sun, the great benefactor of primitive man, who was to him the supreme power, and who is the radiating source of all early religions. With that key and *Leitmotiv*, practically all mythologies may be disentangled.

It would take us far afield to trace the variety of religious observances for the winter solstice the world over. By the time Rome was old enough to make herself heard, this winter festival had been long established. Already there was an accretion of inherited customs of minor celebrations of the winter season. From the Greek Dionysiac festival of harvest rejoicing came the wild orgies of drunken feasts, pig-sacrifices, and animal-maskings. As an imitation of the Golden Age of Saturn, temporary equality between masters and slaves reigned during its term, December 14 to 27. There were gifts and noisy processions, and suspension of all labor "save cooking and baking." During this same period various forms of Syrian and Persian sun-worship were persisting within the Roman Empire, culminating in

the order issued by the Emperor Aurelian (about 275 A.D.) to designate December 25 for the great festival of the "Dies Natali Invictus," or "Birthday of the Unconquerable Sun." The same date was the Nativity feast also of Mithra, the

Persian sun-king, whose lessons of purity and immortality long made him a rival of Jesus to the serious-minded of those early centuries.

Thus influences converged from many pagan sources to single out December 25 as the approved day of religious worship throughout the Roman Empire and farther. Continued observance rooted it deeply in the lives of the people. Just where and how did these pagan and Christian elements finally meet?

The next step in that story is the most important of all Roman feast days—the Kalends or the New Year's Day, which followed close on the heels of the Saturnalia, gradually taking to itself in exaggerated form all the riotous customs of the earlier festival. On this day the Senators took office with prolonged festivities and banqueting. A special feature was made of the decoration of the doorways with green branches, and the lighting of many fires and tapers. Money



Courtesy N. Y. Public Library

THE YULE LOG IN A DANISH VIKING'S HALL, EIGHTH CENTURY

Some writers believe the Yule Log is an embodiment of the "vegetation spirit," and its burning is a symbol of sunshine, to secure the beneficent influence of the sun during the coming year. Others interpret its burning as a solemn annual rekindling of the sacred hearth fire,—the center of family life and the dwelling place of ancestral spirits

was spent lavishly and presents of fruit and flowers sent to friends and officials. The Emperor Caligula, indeed, commanded them from his Senators, and vulgarly stood in his porch to receive them. Perhaps referring to the goddess Strenia (meaning fertility), these gifts were called *strenæ*, a word which has survived in the French *Étrennes* or New Year's Gifts.

Meanwhile, the Christian fathers, turning their back on heathen Kalends, celebrated the Feast of Epiphany on January sixth with prayerful gloom and fasting. They were distressed to find it difficult, almost impossible, to summon their flock to attention and solemn worship so soon after the high old time of the Kalends. Exhortations to reform found meager response, and prohibitions against pagan customs produced scant returns in piety. And then a Daniel came to judgment: some wise head hit on the idea of com-

promise by separating the celebration of the Nativity from that of the Feast of Epiphany, and dedicating to its special observance the twenty-fifth of December, —the listed date of Jesus' birth, the day already fixed in the popular mind as a religious-nativity feast! The people were urged to transfer their devotions "from the sun, and to Him who was the Sun of Righteousness."

Behind the pagan altar and the accustomed gaiety of the Roman Kalends the astute fathers had slipped the frame of ecclesiastical sanction! With the help of such men as St. Augustine and Pope Gregory, the two elements became slowly fused, and as the traditions for worship on that December date brought the flock to the Christian altars, the Nativity of Jesus Christ was permanently attached as a religious festival to December 25. An old manuscript, called the Philocalian calendar, places the first Nativity



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KING OLAF'S CHRISTMAS

"Thor's hammer or Christ's cross: choose!"—So did King Olaf call upon his wild warriors who championed the heathen age, to give up the sword and dedicate Norway to Christianity

festival in the middle of the fourth century. But once this date was accepted, the Church's efforts to eradicate all pagan observances and reminders were pursued with energy, later with vehemence. The green decorations and the fires were especially denounced as signs of wickedness. "Let the heathen kindle lamps" — writes Tertullian, "they who have no light. Let them fix to the door-posts laurel branches to be burnt But thou, O Christian, art a light to the world, a tree that is ever green. Make not a pagan temple of thy own house-door."

The practice of animal-masking and mummers, accompanied usually by extravagant actions and indecencies, was even more violently denounced. Most primitive religions used animal dress and masks in their processional rituals, because it was believed that by assuming the outward form of the sacrificial animal,—the skin as a garment, the horns as headdress, and so on,—its sanctity, its desirable power, would be transferred to the worshiper, and the mystic contact, a chief function of sacrifice, thereby achieved. Not until in 729, when Pope Zacharius forbade the Kalends forms of celebration by strictest injunctions and added them to penitential offenses, could the revelers be restrained. However, after these many centuries, they may all be found revived, in modified form, attached to the modern Christmas.



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CHILDREN SINGING CHRISTMAS HYMNS

In some German towns the old custom of singing Christmas hymns from church towers is still continued. One of these songs is "Von Himmel Hoch," written by Martin Luther, after the Reformation, especially for his little son, Hans

Asceticism and prayer dominated the medieval Nativity festival until a feeling for freer expression brought from the lowly peoples of Europe the Miracle Plays, the Noëls, Carols, and *Weihnachtslieder*, which are a mine of beauty in themselves well worth exploring. Exquisite loveliness and tender affection combine with crude naturalism and peasant humor in the naïve telling of the story of the Holy Birth. The *presipio*, *crèche*, or crib was the plastic rendering of the same theme in similar mood. St. Francis of Assisi is reputed to have originated it (not authenticated). However, he is known to have



Courtesy N. Y. Public Library

ENGLISH MUMMERS

The wearing of animal masks by mummers at Christmastime apparently is a survival of the old pagan festival rite of wearing the hide, head, or horns of a sacrificial animal, so that the divine life or sanctity of the victim may be transferred to the worshiper

used it in a Christmas service at Greccio in 1224. Later, this charming institution spread through all parts of Europe and may still be found in the congenial atmosphere of the Catholic churches. An ancient "Feast of Lights" entirely unrelated to Christmas except for its nearness in date, is the Jewish "Hanukkah," in commemoration of the Maccabean victory when the candles could be relighted on the altar of the restored temple of Jerusalem.

Another side of our cultural heritage, the still older Scandinavian mythology, contributes the sheaf of the Yule-log traditions, dating from the legend of Yggdrasil, the Tree of Life, and forms of tree-worship common to the druids and other rude religions. This was often a feast for departed spirits as well as a protection against evil powers and a charm to assure fertility or good luck. The Yule season emphasized the good things of life and the sharing of them with the less fortunate. It was an aristocratic festival, for the log-

fire was only for the hearth of the wealthy; others contented themselves with a bundle of faggots or a few sticks. But always and in every locality, there was some formal ritual that attended the bringing-in and the lighting of the log on the hearth. Oak, holly, ivy, and mistletoe had each its own place in the feast-time; the evergreen, perhaps because of its connotation of immortality, was finally chosen as the most important.

But the Christmas-tree, as we know it, came to us from German soil and is a truly democratic and domestic institution. An unfounded story suggests that Luther started the custom for his children to repeat the beauty of the starry heavens; actually the origin is not known. German writers mention it as early as 1605, and by 1737 it had already become the real *Weihnachtsbaum*. Useful presents had no place on it, it was all glitter and candles, tinsel, wonderful stuff unrelated to everyday life. The symbolism of the figures of



Courtesy N. Y. Public Library

A NATIVITY CRADLE IN TYROL

Plastic representations of the Nativity at Bethlehem are the special delight of children at Christmas-time. St. Francis, it is said, in 1224 used a real ox and ass, in a Bethlehem scene



Courtesy N. Y. Public Library

THE CRÈCHE IN A CHRISTMAS PROCESSION IN FRANCE

"The village children, armed with tapers . . . carry about the streets . . . a little crèche, singing as they go"



Courtesy N. Y. Public Library

A CHRISTMAS MORNING CUSTOM AT LAKE COMO
Burning a "tree" of evergreens and flowers, to which all the congregation contributes

dolls and animals, gilded nuts and fruits, always hung on the tree, harks back to the Kalends and older festivals. From the richest to the poorest, every home hoped to show the lighted tree to welcome in Holy Night. It was decked in great secrecy by the elders, then the whole household, including the servants, gathered around its aromatic, bedecked branches to sing the *Lieder* to the *Kristkindel* (Christ-child). There is an element of naiveté in the German folk attitude to God,—*der liebe Gott* is an approachable, lovable, personality,—which makes possible also the inclusion of the appearance of the *Kristkindel* under the humble roofs on Christmas Eve. His companions went under many names and had many attributes, but the most constant was *der heilige Sankt Nikolaus*. He was called *Sankt Klaus* in Holland and no doubt emigrated with the Dutch settlers to this country to become Santa Claus in the American lingo. The original St. Nicholas was a bishop of Myra in Asia Minor in the Fourth Century. Legend tells of his miracle in restoring to life two murdered boys (in spite of their having been chopped up and pickled in brine by a villainous inn-keeper), and of his many kindnesses to children, which accounts for his having become for all time the children's saint.

It was long before England accepted the Christmas-tree. The Puritan regime suppressed anything that hinted at "Romish" custom, so the

candles and tapers were taboo. But, directly or indirectly, through German influence it crept into the homes, to be ultimately introduced into good society by Queen Victoria and her German Prince Consort.

Because of their beauty, two minor Christmas legends should not be ignored: of the miraculous power of Christmas Eve that brings blossoms to the buckthorn and other forest-trees at midnight, and that makes the lowly cattle kneel in their stalls, and lift their voices in exultant reminiscence of the holy time when their ox and ass forbears with their warm breath brought comfort to the Infant Saviour in the manger, and bore witness to the glories of the Nativity night.



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ST. NICHOLAS AND PIET, HIS BLACK SERVANT

In Holland a man acting as St. Nicholas, the patron saint of the children, rides through the streets on St. Nicholas Eve, December 6, promising rewards to those who have been good

SAMOAN CHILDREN AT WORK AND PLAY

Childhood and Youth. A Tropical and Idyllic Land to Which the
Modern Psychological Problems of Civilized Youth Have Failed to Penetrate

By MARGARET MEAD

Assistant Curator of Ethnology, American Museum

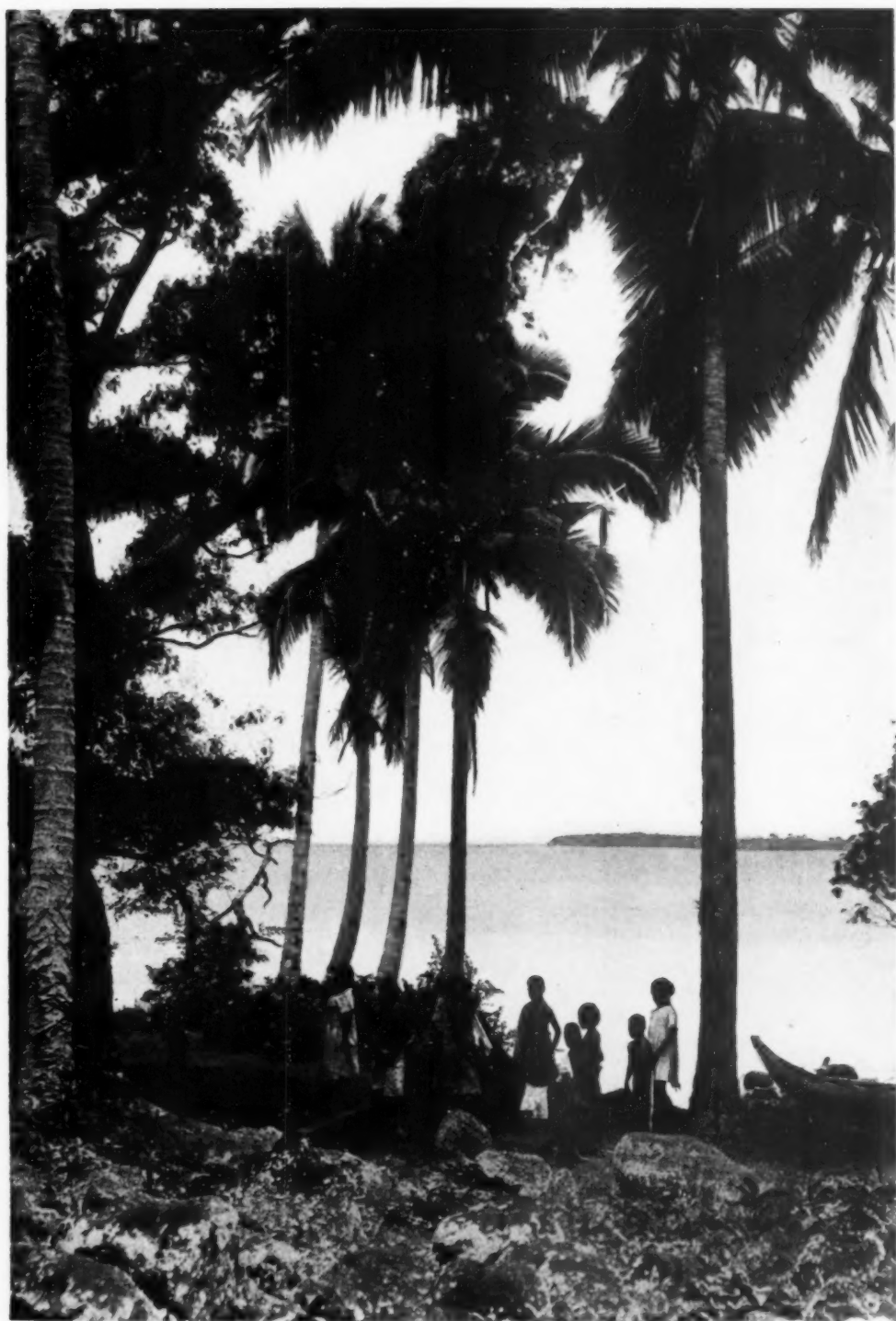
WHEN anthropologists make trips to the far corners of the earth and search out the primitive peoples who live there, they do not go only in search of spears and bows, moccasins and snowshoes, tortoise shell rings and shell bracelets. Neither is their interest confined to measuring the height of the heads and the width of the natives' noses. Nor are they contented when they have dug among the ruins of earlier villages and extracted ancient, forgotten forms of stone weapons from shell heaps and ruined fireplaces. But they study also the lives of the people, birth ceremonies and burial customs, marrying and giving in marriage, all the quaint and curious ways in which these isolated groups of human beings have made a pattern within which to live their lives. These studies add to our knowledge of the different ways of life under which human existence is possible, of the different kinds of demands which human beings can meet bravely and well.

It was to add to our store of this kind of information that I went to Taū, a little island in American Samoa, and spent nine months living among the few hundred South Sea Islanders who inhabit it. As a Fellow of the National Research Council I went there to make a study of Samoan children and Samoan girlhood, to find out if the pains and pangs of growing up were as difficult in Samoa as in America.

This was no problem which could be solved in a flying trip. I could not just walk into the round, unwallied houses, with their high thatched roofs and pebbly

floors, sit down on the mat which is always spread for strangers, and say to the guest-house mother who sat nursing one baby while a little older child tangled her half-finished mat, "Well, now, tell me, what are your children's names? How old are they? And Flower is the oldest? Does she take her responsibility seriously? Is she good and obedient? Is she bossy with the other children? Was she jealous when the new baby came?"—and then pass on to the next mother and ask her the same kind of questions, putting the answers all down on cards, to be counted and written up after I got back. If that mother, in her soft Polynesian language in which her children and I made the same mistakes, had answered my questions directly, I should not have understood her answer. For they would have run something like this:

"Names,—well, the baby's name is Pandanus Nut, that's what we call it, or just Nut for short. But its name from its father's father's family is 'The One that Does Not Move,' and only yesterday my younger brother gave it his name of 'Lighted House,' so perhaps we will call it that now. And how old is he? Well, he was born after the second Palolo Fish Feast, and before my young cousin, Hibiscus, had her baby girl. He can't walk yet. The next one to the baby is called Bonito Fish. He is a boy. I don't know how old he is. And Flower, she is a girl, is the oldest of my children who are at home. There is that one, a boy, his name is White Stone, who lives with my



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IN THE SHADE OF SAMOAN COCONUT PALMS

Samoan children have no recognized group activities, nor do they take any part in the social life, except that of formal dancing



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THE MORNING DIP

Childhood's universal objection to the bath appears to be lacking in these small Samoans. Young babies are frequently bathed with the juice of a wild orange and rubbed with coconut oil



Photograph by Mrs. William Churchill

A CLUSTER OF SAMOAN HOUSES

The Samoans still live in open-sided conical-roofed houses, the only walls of which are the woven mats, lowered in inclement weather



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A SAMOAN FAMILY GROUP

Except for ceremonial occasions, the native bark-cloth clothing has been discarded for a costume made of the more easily obtained cotton cloth



Photograph by Mrs. William Churchill

SAMOAN BOYS

Children under fifteen or sixteen have no social standing in the community



Photograph by Mrs. William Churchill

THE FEAST OF A MALAGA OR FORMAL TRAVELING PARTY

Weddings or guests from a neighboring village are occasions for important festivities



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AT THE PEAK OF THE MIDDAY HEAT

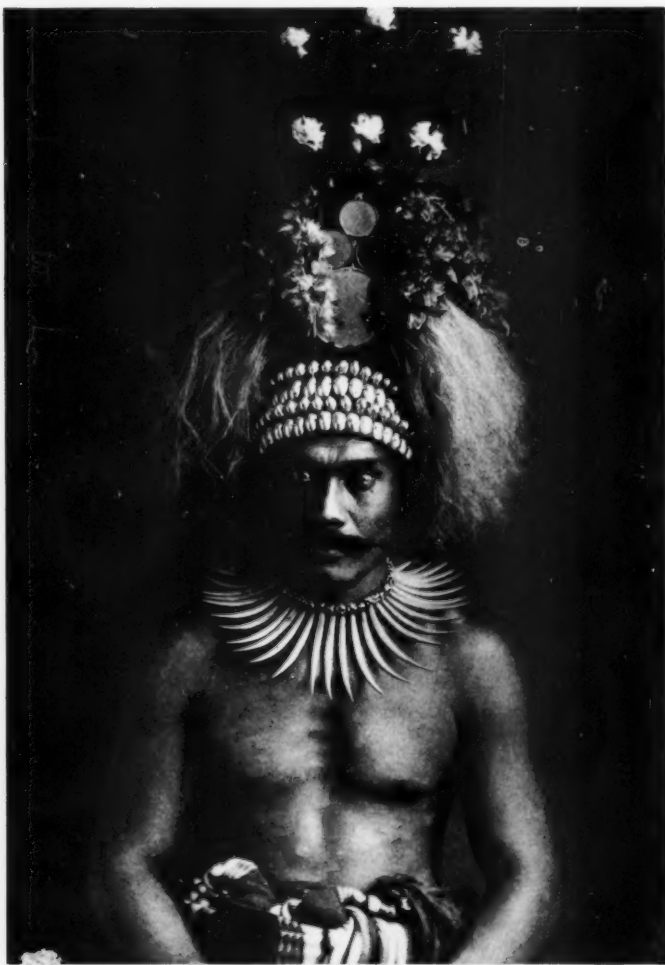
When shade and the siesta are most important to the villagers, the children go off for a swim



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HOUSEHOLD ACTIVITIES AT THE EDGE OF A LAGOON

Metal utensils now replace the coconut shells formerly used for household purposes



THE HEIR APPARENT OF AN IMPORTANT CHIEF

Any of the more powerful rulers has as one of his privileges that of giving the title of *manaia* to his heir

mother, and the girl, her name is Jellyfish, who lives with my first husband's sister in the next village. No, my first husband isn't dead! He's married to the sister of that woman with the banana leaf over her head, who is going down to the sea for water. I don't know what you mean by responsibility. Do you mean she has got common sense in her head enough to know that she mustn't play with her brother nor touch any of his things? She listens easily, not like my brother's children, who listen with diffi-

culty to my brother's commands. Is she bossy? Of course she is bossy to all those in the family who are younger than she is, and listens to the wishes of all those who are older. And which new baby do you mean? My sister's baby, or my younger sister's baby, or my brother's wife's baby? But of course she was glad when all the babies were born."

Only after I had learned to speak the language well, and had spent long mornings sitting gossiping over a coconut or a plate of bananas, after I had learned to plait mats and blinds and helped the harassed homeless people rebuild the village after a devastating hurricane, and had spent even more hours with the little girls themselves, searching for shells, weaving flower necklaces, coaxing land crabs with a low, sweet chant, or swimming in a hole in the reef, did I come to know enough

about the Samoan way of life so that I could have understood those answers.

Samoan children's names change often, at the whim of any relative. As soon as they are old enough, they are allowed to choose new ones for themselves upon any occasion. And similarly they choose their own homes, living now with a grandmother, now with an uncle. Families are not made up of father and mother and children, but of some fifteen or twenty relatives among whom there is no oldest child, because a young aunt or cousin will

be nearly of an age, among whom the same child is never "youngest" for many months. And in these great households the mothers take very little care of their children after the babies learn to crawl. The nurses are not young girls but toddling five-year-olds, who trundle about upon their hips babies that are too heavy to be lifted into their arms. Samoan children are not carefully disciplined and supervised until they are five or six, and then, properly trained, given some freedom. They are spoiled and pampered by their baby nurses until they are five, and then, if they are girls, they are turned into nurses themselves; if they are boys, they are turned over to the rough but thorough discipline of older boys. At ten years of age they are sturdy, well-behaved youngsters, although their bringing-up seems so strange to us.

Samoan parents do not hide anything from their children; they tell them no fairy tales about the birth of babies nor do they pack them off to a relative until after a funeral. They believe quite literally that children should be seen but not heard, should be present but make no comments, should learn the important facts of life from careful observation, not from random, groping experimentation. And the children grow up, acquainted with the rhythm of life and death, accepting life as simply

and unrebellingly as do their parents.

Nor do Samoan parents think children should not work. The tiniest little staggerer has tasks to perform,—to carry water, to borrow fire brands, to fetch leaves to stuff the pig. And these slighter tasks are laid aside for harder ones as soon as the child becomes strong enough or skilled enough. At the preparation for a feast to celebrate a visiting chief, a marriage, or a new canoe, the little children feel very serious and important, and go scurrying about the village, muttering, "There are



A VILLAGE CEREMONIAL PRINCESS

The girl at the left has been honored with the title of *taupo* and with a distribution of property by a high chief of her village. Her prestige is great as there are but two or three *taupos* in a village



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AFRAID OF THE CAMERA

The small boy in Samoa, until he is eight or nine years old, helps take care of the younger children



Photograph by Ewing Galloway, N. Y.

IN AMERICAN SAMOA

A visit from a neighboring tribe is the occasion for a ceremonious welcome



BEAUTIFUL SAMOA

The harbor at Pago Pago is exceptionally fine. In the foreground is an outrigger canoe



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A DANCING GIRL

The one activity in Samoa in which everyone, regardless of sex or age, participates, is dancing

very great complications in my household." Learning to run errands tactfully is one of the first lessons of childhood, and a child of nine will be trusted to take a valuable piece of bark cloth to barter for a pig.

This attitude toward children as little adults although lacking in experience and sometimes sadly devoid of common sense, makes for a different kind of play also. Samoan children have no dolls, no play

houses, no tea sets, no toy boats. For dolls they have real babies; at six they are expected to sweep up the real house and pick all the scraps off the floor. Little boys anxious to become boatmen paddle about in real canoes within the safety of the lagoon. Embryonic eel fishermen hold the bait for their big brothers, but never play-act fishing in a pail, or catch a leaf and pretend it is an eel. Yet they have their games, play-

ing at ball with square light balls made of pandanus, stringing necklaces of flowers, playing round games to merry songs of their own improvising in the dusk. And in all these they but imitate their elders, who follow a morning of work and an afternoon of sleep with an evening of dance and song.

Strangest of all to us is the Samoan opinion of precocious children. To be brighter than your age, to stand out conspicuously above other children, this is the sin for which a child is roundly scolded and sometimes whipped. So it is that the happiest children are those who like to be children, who put off responsibility, who do what is asked of them without aspiring to more grown-up tasks, those who answer in lazy content, "I am but young."



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A SAMOAN BEAUTY



Photograph by A. M. Bailey

YOUNG WESTERN GREBE

FEATHERED WATER BABIES OF THE PRAIRIES

Birds of the Shallow Ponds of the Dakotas—Grebes and
Gulls—Pelicans, Cormorants, and Terns

By ALFRED M. BAILEY

Director of the Chicago Academy of Sciences

THE rolling prairies of the Dakotas, with their vast expanses of grazing grounds, were once the homes of great herds of bison. Antelope occurred in large numbers, and deer were abundant along the wooded bad lands. Today there are few of these mammals, for with the march of civilization it was inevitable that they should disappear.

As with the mammals, so it has been with the bird life. Flocks of wild fowl which "obscured the sun" were not uncommon in the old days, but now only a remnant remains. And yet, even now a visitor to the out-of-the-way lakes cannot help but marvel at the number of birds on all sides.

When the glaciers came from the north, they gouged great basins, and today we find the treeless Dakota prairies studded with a myriad of ponds, sloughs, and lakes, along which our wild fowl build

their nests. Many of the lakes are alkali, and but little vegetation grows, so they are of little use to the nesting birds; but others are fresh and support a luxuriant growth of cat-tails, tules, and cane (*Phragmites*). Such a place is Rush Lake in northeastern South Dakota.

Wild ducks of several species,—mallards, blue-winged teal, gadwall, ruddy, pintail, shovellers, and red-heads may be seen daily, and occasionally, when one walks along the grass-grown banks, he is startled by a female duck flushing from beneath his feet. The nesting birds are shy, however, and if given an opportunity, will sneak quietly from their nests.

While securing life history "nature studies" on motion films for the Chicago Academy of Sciences, our party had ample opportunity to study many species of birds at close range. We found nests and erected blinds, and then, when the



Photograph by A. M. Bailey

RUSH LAKE, SOUTH DAKOTA

This shallow pond is similar to many others that dot the prairies from the sandhills of central Nebraska to the Canadian border and beyond



Photograph by F. W. Kubecek

RING-BILLED GULLS

Far into the interior of the continent the gulls have penetrated, sometimes inhabiting the shores of lakes and ponds far removed from other bodies of water



Photograph by A. M. Bailey

AN ADULT HOLBOELL GREBE

When the young grebes are hatched, they are carried for a time on their parents' backs before they themselves take to the water



Photograph by A. M. Bailey

DOUBLE-CRESTED CORMORANTS

The cormorant is related to the pelican. These birds are powerful swimmers and expert divers, and their hooked bills serve them well when they catch the fish on which they live



Photograph by W. F. Kubecek

YOUNG AMERICAN COOT

This youngster, occupying a comfortable nest among the reeds, is evidently the first of the brood to break from his shell

parents returned to their nests, they were photographed. It was interesting to note how the different species reacted to the blind, and the reaction of individuals of the same species. Some birds that are ordinarily extremely shy, returned with little fear, while others that are considered tame, would not return at all.

The blue-winged teal is typical of the average species, for after eying the blind from all angles for an hour or so, the little female crawled mouselike through the brown grass, and crept upon her eggs without so much as showing her back above the protecting vegetation. Teal are numerous in the Dakotas, and many thousands nest there annually.

These lakes are particularly favored by the diving birds, and we saw hundreds of nests of the western, Holboell's eared, and pied-billed grebes. It is possible that the horned grebe nests there also. In our moving-picture work we concentrated

on the western, or swan grebe, which is known as the most beautiful of the divers, and on the Holboell's, which is considered one of the shyest of water fowl. The former nested in the cane and tules of reed-grown ponds, while the latter built bulky nests of moss near the shores of large open lakes.

With the glasses we often could see several birds perched upon their mound-like nests, but when we showed ourselves, the birds quickly covered their eggs with a few deft dabs of the bill, and slid into the water. The western grebes were nesting in such deep water that it was necessary to build a platform to support the blind, and from our narrow perch we could see a dozen of the beautiful fellows cruising among the golden yellow canes, their reflection mirrored in the quiet depths.

An adult would swim behind heavy growths of vegetation to the edge of her



Photograph by Earl G. Wright

THE NEST OF AN AMERICAN COOT

The average number of eggs in such a nest is from eight to twelve. Sometimes the number drops to six or seven and sometimes it is as high as seventeen or eighteen. On at least one occasion twenty-two eggs were counted in one nest, but it is probable that they were the product of more than one bird



Photograph by Edwin Komarek

BABY PIED-BILLED GREBES

Each of these youngsters, fresh from the shell, still bears the strange little "egg tooth" on the end of his beak. The only purpose of this "tooth" is to make it possible for the little fellow to break the shell. Shortly after the bird is hatched, the "tooth" falls off



Photograph by A. M. Bailey

NEWLY HATCHED WHITE PELICANS

These awkward birds are unattractive at this stage because of their nakedness. But even when they have attained a covering of down a few days after emerging from the shell, they still lack beauty



Photograph by A. M. Bailey

A MOTHER WESTERN GREBE ON HER NEST

The western grebes, sometimes called swan grebes, are without doubt among the most aquatic of birds. A cousin of this bird—the grebe of Lake Titicaca, South America—has lost some of its power of flight and is helpless, as well, on land



Photograph by Earl G. Wright

A YOUNG WESTERN GREBE

Unlike his cousin, the pied-billed grebe, this little fellow, just emerged from the shell, is not striped. Note the toad in the nest. This is a common occurrence in the marshes



Photograph by W. F. Kubeck

RING-BILLED GULLS

The gull is widely supposed to be essentially a salt-water bird. As a matter of fact, gulls of several species are to be found in South Dakota, and many inland lakes support thousands of them

nest, and then remain quietly hour after hour, just eying the blind. Many of these swan grebes had hatched their young, and the downy little fellows would perch upon their parents' backs as the old ones cruised to and fro. Although we saw the adults continually, they were extremely shy, and remained under cover of the swamp growth. The bird we were attempting to photograph would swim to the edge of her nest, where she would "chuck" to the young one in an attempt to coax it away. The youngster became entangled in the grass of the nest and could not reach the parent, so—after hours in the stifling blind, we were rewarded by having this grebe climb upon her home.

The western grebes apparently do not conceal their eggs when they leave the nest,—at least not to the extent that the Holboell's do. This latter species is not so large as the former, nor so strikingly

marked, but it nests on open lakes where one can see it at a long distance. We were in our blind many hours before the parents ventured to return to their nest, and then one of them climbed upon the mound and removed the mossy covering, rolled the eggs over with her beak, and settled down upon them without paying the slightest attention to the whirring of the camera. When we clapped our hands, she quickly covered her eggs and slid into the water, and so furnished us with a fitting close to that bit of film.

The Bartramian sandpipers are still found in many of their old haunts, although their numbers have been woefully diminished. We found a nest with three eggs upon a boulder-strewn bit of prairie, and erected our blind. It was a stormy, blustery day, so the blind thrashed madly in the wind, and the brown grass whipped back and forth. It did not seem possible that this "wader," which inhabits the dry



Photograph by A. M. Bailey

AMERICAN WHITE PELICANS

A close examination of the bird in the center of the foreground will show a small hump about two-thirds of the way down the top of his bill. This decoration is worn during the breeding season, after which it drops off



Photograph by W. F. Kubecek

DOUBLE-CRESTED CORMORANTS

The birds are quite similar and closely related to the cormorants tamed in China and Japan for use in catching fish



Photograph by W. F. Kubeček

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uplands, would return to her eggs, but in fifteen minutes we saw her standing motionless fifty feet away. She disappeared after a few moments, and when we next saw her, she was twenty-five feet away. In less than half an hour she had settled upon her eggs!

Coots are very tame, ordinarily, and yet they seemed very shy about returning to their nests. It took hours in the blind before the *poule d'eau* behaved satisfactorily. Another tame species is the black-crowned night heron. Ordinarily, colony nesting birds are very easily photographed, but, although we left our blind for days, and spent two days in the blind, we did not get a foot of film. We could hear and see young birds being fed all about us, but the youngsters we had under observation were fed at night. A horned owl was living in comfort on that little bird island, for he lived upon the young herons.

In Waubay Lake, a few miles from Rush Lake, is a little rocky islet known to the people of the vicinity as Bird Island. It is appropriately named for there was a colony of five hundred double-crested cormorants, and about three hundred of the common terns, and an equal number of ring-billed gulls. These birds were typical of many of the island colony nesting species, for they readily returned to their nests, and were little alarmed when the camera was turned upon them. The cormorants were well advanced in their nesting, and the hundreds of bulky platforms contained from three to four downy black fellows with long necks and reptile-like heads. They keep their heads bobbing, and they make a strange noise, the combined noises sounding like the

faint roaring of the wind. The beautiful gulls and terns were very tame, the former quickly returning to the large downy young hidden in the grass, while the terns settled upon their three dark-colored eggs.

One could write of many species which occur commonly, the beautiful Wilson's phalarope, Hudsonian godwit, western willet, killdeer, spotted sandpiper, Franklin's gull, and the black tern. One can hear the booming of the prairie hen and the querulous cry of the Forster tern, while during migration time, great hordes of blue, snow, and Canada geese honk their way through to their northern nesting grounds.

The ponds and swamps of North Dakota support a bird life which is as interesting as those of South Dakota, and on one of them, Chase Lake, in the south central portion of the state, we visited a large colony of white pelicans. There were about eight hundred of them nesting upon a large island in the middle of this alkali lake, which has been made a Federal Bird Reservation, and as they have been carefully protected, they were extremely tame. Anyone but a bird photog-

rapher could wax poetic about these beautiful white birds with their black pinions, as they sail on motionless wing against a dark storm-whipped sky, or as they settle to their nests, where their ugly youngsters are waiting with wide-open beaks, but he must fight sunlight and shadow and drizzling rain to see that his exposures are uniform.

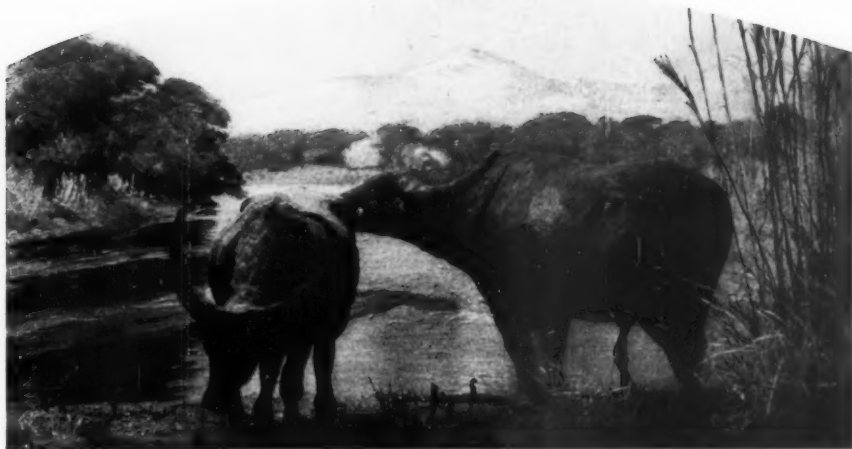
Weeks later, when the film is assembled, he begins to appreciate the beauties of stormy, billowy, Dakota skies, and the marvels of the bird life that still abounds.



Photograph by W. F. Kubecek

THE COMMON TERN

These little birds are widely distributed in Europe, Asia, Africa, and America



SKETCH MODEL OF INDIAN BUFFALO GROUP

THE JUNGLE LAND OF BURMA

How a Museum Expedition Collects the Information and Material for the
Foregrounds and Backgrounds of the Great Habitat Groups

By ALBERT E. BUTLER

Department of Preparation, American Museum

Mr. Albert E. Butler, the author of this article, was sent during 1928 to India, Burma, East Africa, and Angola, in order to obtain the material and the data with which to construct the backgrounds for several animal groups collected by Mr. Arthur S. Vernay and Col. J. C. Faunthorpe for the American Museum of Natural History. In the following article, Mr. Butler tells of some of his experiences and his work in Burma, where he—in company with Mr. C. C. Rosenkranz—went to obtain the backgrounds for the Tsine buffalo group, the Thamin deer group, and the Sumatrensis rhinoceros group, the animal specimens for which had already been collected. The expedition first visited northern India, and on completing its work in the shadow of the Himalaya, moved its scene of activities to Burma.—THE EDITORS.

COMING from the cold of North India, near the Himalayas, on the border of Nepal, to the warmth of southern Burma, in itself is a pleasant experience. I had long looked forward to that part of my trip, but when we arrived in the harbor of Rangoon, it was not without a certain feeling of disappointment that I looked upon much the same type of harbor city that I had seen in India. Modern buildings, wide paved streets, and many automobiles, most of them of American make, gave a distinct western air to this far eastern city. The one varying note in the picture from the

harbor is the gold of the frequent spires of the pagodas which glisten dazzlingly in the bright tropical sunlight. One's impressions gradually shift as one sees more of the city and realizes that its population is mainly Burmese, and that these smiling people still cling to their native customs and dress, a rare few showing any influence of western civilization in their personality.

The native *poongyis*, in their yellow robes, are amazingly numerous and apparently well taken care of by these simple people of whose religion the *poongyis* are revered priests. Temples of wor-



ON THE OUTSKIRTS OF RANGOON

These huge statues of Buddha are occasionally to be found dominating the Burmese landscapes. More often, however, the statues are far smaller and housed in the numerous temples and shrines

ship, the pagodas, are numerous, quite imposing, and usually house gigantic and grotesque idols. The immensity of these figures is felt only when one is seen occasionally in the open landscape. Then they appear like huge ogres threatening everything in sight.

The more common means of conveyance, the rickshaw, is seen everywhere, and much of the trucking is done by heavy two-wheeled carts which are pulled and pushed by natives, usually several to a cart—varying with the load.

Further inland the towns are almost entirely native, with but a handful of English government officials. Such a place is Tuangdwyngyii, 250 miles north of Rangoon—a town of about three thousand Burmese and a dozen English.

To this native city we made our way enthusiastically, keen for our first glimpse of the interior of Burma. Our work called for the gathering of those innumerable specimens of the flora and geology of the

country that were required in order to complete at the American Museum the foreground and background of the group of *Thamin* deer, which had already been collected by Colonel Faunthorpe, as well as similar material for the group of *Tsine* buffalo which was to appear finally in a setting of bamboo forest.

Probably there is no wide understanding of the great amount of detail required for the proper completion of such a museum "group," for quite naturally the animals dominate the completed exhibit and often the work of the preparators in completing the details of foreground and background fail to impress the observer proportionately.

Each group presents a different problem and the differences are often radical. Each setting must be typical of the country in which the animal is found, and in order to collect specimens of soil, rocks, grasses, and leaves, it is essential that studies be made of exactly the proper

surroundings. It is the business of the preparator to select a site that will make possible the collection of those materials that he will require, and, of course, careful studies must be made by the artist in order that the setting may be not only typical but also, in so far as possible, artistic. With these points in mind, the preparator and artist who enter the field—in the case of the Burmese trip, Mr. C. C. Rosenkranz was the artist and I the preparator—agree as to the vicinity to be reproduced in the group. As soon as this is done, the artist goes about his work of making landscape paintings and studies of trees, flowers, and so on, while the preparator proceeds to collect such material as is typical of the region and suitable for reproduction in wax, celluloid, and other media of his art. Occasionally large quantities are needed.

Any grasses required, for instance, are collected and packed carefully so as not

to become broken in shipment, for such material can be preserved, recolored, and actually utilized in the group. Leaves and twigs of the plants selected are carefully packed in tanks containing a formalin solution—tanks for this purpose having been specially made and included in the field outfit. Plaster molds in series are made from leaves of each plant form, and similar molds are made from flowers in much the same manner. Color sketches are also made in order that the artificial reproductions may closely immitate nature, and if time permits, wax reproductions are sometimes made on the spot and colored in imitation of the freshly growing plants. Samples of rocks and sections of tree bark usually are all that is necessary of such material, for these can be faithfully imitated in the work shops of the Museum where paper maché and plaster take their place. Surface earth, twigs, and leaves are usually collected in sufficient quanti-



PREPARATIONS FOR A RELIGIOUS FESTIVAL

These structures—both the “temple” and the float—are constructed entirely of bamboo and paper. They are highly decorated in gilt and color, and are burned at the conclusion of the festival



A STUDY FOR THE BACKGROUND OF THE TSINE BUFFALO GROUP

This painting, by C. C. Rosenkranz, was made in the bamboo forest near Kikkogon, about 200 miles north of Rangoon



IN THE DEPTH OF THE BURMESE JUNGLE

A photographic study for the background of the *Sumatrensis* rhinoceros group, made near Taikkyi, about fifty miles north of Rangoon



A NATIVE BURMESE BULLOCK CART

These crude two-wheeled contrivances are the only transport for heavy materials in the native towns of the interior of Burma



A BAZAAR AT TAIKKYI

Usually each town holds a bazaar once a week. Practically all of the native bartering is carried on at these gatherings

ties to cover the surface of the space devoted to the group, and finally, innumerable photographs are made of every element that enters into the building of the group.

When one realizes that it is the task of the preparator and artist to gather the fragile materials for making and building a group, and to make accurate color sketches and molds of every type of leaf, twig, blade of grass, and stone within a space of, say twenty feet square, in the jungle, besides painting a view from the spot that has been chosen, it is a little easier to realize the amount of detail work that is required.

Naturally many unexpected obstacles arise, and we had no sooner reached Taungdwyngyii than an insurmountable one faced us, for we had not been informed that a festival commemorating the anniversary of the death of a local saint priest was scheduled for the next week, and that the entire population was planning to take the week off in celebration. We

managed with no little difficulty to get transportation to the *Thamin* district, which was near by, and completed the work there. Fortunately, the site we chose for this work was not far from town, for we soon found that no inducement we could offer would influence any native to desert the coming festival celebration for as much as a full day.

Finding it impossible to move to our next site, we attended the festivities on two evenings while in Taungdwyngyii. For this we had no trouble finding an escort. Furthermore, the celebration was entertaining and amusing, though the ceremonies were not within our understanding. Many structures built of split bamboo, of dainty design and color, had been erected for the occasion, only to be burned when the festival was completed. In half a dozen of these places dances and plays were given upon improvised bamboo stages, and the entertainments were carried on far into the night. We did not remain to see whether the actors or the



MR. BUTLER WORKING ON A SCALE MODEL

This model is of the *Sumatrensis* rhinoceros group, which ultimately will be erected life-size



A PART OF THE EXPEDITION IN THE FIELD

Mr. Rosenkranz is seated in the center of the group with Mr. Prater of the Bombay Museum, together with several guides and carriers, at a rest house on the way to camp near Taikkyi

audience tired first, but I concluded that the play could end for no less a reason, since all I saw in several hours seemed to be a constant repetition of the first few minutes. The plays must have been comical, however, for the audience laughed frequently at the chanting chatter. We couldn't appreciate the jokes that appealed to them, but we did occasionally get a laugh when an actor stopped in the middle of his line and spat under the stage bamboo rug, or a dancing girl stopped her act to scratch her leg. These incidents seemed not at all amusing to the audience, however, and our laughter, no doubt, seemed to them to be both ill-timed and ill-bred.

An interpreter told us that the body of a certain deceased priest had been preserved in honey, and that at the end of the festival this preservative was eaten by as many as were fortunate enough to get a share of it. However this may be, I abstained from eating any native honey while in Taungdwyngyii.

It was impossible for us to see the festival through to its end, for our plans could not be made to fit the occasion. Consequently, after three days we moved to Kokkogen, twenty miles farther south, near which, we were told, was heavy bamboo forest. Furthermore, we were told that at this new town we would be able to obtain the necessary help to carry on our work. The forest we chose was mainly composed of tall, small-leaved bamboo mixed with teak and other trees of large-leaf varieties. The delicate masses of bamboo leaves resembled vast collections of green feathers, forming an odd contrast to the huge teak and other leaves, many of which measured fourteen inches wide by thirty inches long.

All through this region we found the bombax and "flame of the forest" trees in bloom. The leaves do not appear until the blooming period is over, and the glow of these densely red-flowered branches in the sun is an amazing spec-



THE EXPEDITION HEADQUARTERS AT TAIKKYI

These forest bungalows are erected by the British authorities, and by arrangement with the governmental officials the expedition made use of them. In this particular house several natives were murdered shortly before the arrival of the expedition, much to the discomfort of the expedition's carriers

tacle. The bombax flowers, which last about three weeks, contain a nectar that is intoxicating, and the birds flock to these trees at first sign of dawn and leave reluctantly at dusk, screaming, quarreling all day long, their excited chatter resembling a drunken brawl.

The bamboo forest in which we worked was filled with bird life. Wild peacocks and jungle fowl being common and easily secured, we relied upon these mostly for meat in camp. We sketched and photographed and gathered specimens in the midst of a veritable aviary.

It was our misfortune, however, to be working on schedule and when, after four days, we completed the work of securing material for our *Tsine* group, we broke camp in the early morning and trekked six miles back to Kokkogen. We rested in the town until train time, sitting meanwhile on the verandah of a little hut owned by a Mohammedan merchant, who permitted us to have our lunch there, sheltered from the intense heat of mid-

day. We noticed that he observed us closely during lunch, and we hastened to assure him we were eating no pork under his roof. This would have been a mark of great disrespect.

While our host's old father lay sleeping on a bench near by, his pretty wife, a Burmese girl, attended her tiny baby and part of her husband's store at the same time. The dogs, cats, and chickens, of which there were many, wandered on to the porch and through the house whenever they were unwatched. The poor creatures seemed so hungry that they were willing to brave a kick for a morsel of food, but in the absence of something to eat they seemed always ready to bolt at the movement of a human hand or foot.

Our return to Rangoon was necessary before proceeding to Insien to collect the materials for one remaining group, the *Sumatrensis* rhinoceros. Our original plans had called for just the reverse of the schedule we found ourselves following. Because of an uprising in the district, at

the time of our landing in Burma, government officials had informed us that it would be unsafe for any whites to venture into this section. During our ten days' absence in the vicinity of Tauagdwynghii and Kokkogen, however, matters had quieted down, and we were permitted to go, but were advised to complete our work and get out as speedily as possible.

Unfortunately, three native servants of an English official had been murdered at the forest bungalow we were to occupy. We tried to keep this from our boys but, upon coming in contact with the natives at the new camp, they soon learned all the uncanny details. With much reassurance of their safety and with our permission that they be allowed to occupy a large room in the bungalow across from our quarters, they seemed to be quieted for the time. But we found on the following morning that they had barricaded their doors and armed themselves with every available weapon for protection in case of emergency.

The forests about Insien are matted with a heavy large-leaved vining bamboo known as wathabut, among which are scattered huge banyan trees, wild bananas,

and other palms. An occasional tree massed with purple flowers rising out of the tangled impenetrable wathabut in the morning mist of the Insien forest was a sight to remember. It was of surroundings such as these that we made our records, for it is among vegetation like this that the rhinos live.

We would have been willing to spend far more time amid the beauties of the bamboos than our work required, but our schedule pressed us, for we were to sail for the Seychelles and East Africa, there to gather still other backgrounds. So pleasant had been our task that even our native boys seemed downcast at our leaving. They had proved willing, intelligent, and faithful, and even across the gulf that constantly exists between the lower classes of the East and the "Sahibs" from the West, we felt the friendliness of these sincere and gentle people, as, we hope, they felt ours for them. They returned kindness with kindness and consideration with consideration, with the result that we remember them very pleasantly indeed, as we also remember all the jungle land of Burma in which these gentle people dwell.



THE RAILROAD STATION AT TAIKKYI

Showing the bullock carts that brought the expedition equipment from the last camping place in Burma

FISH AND FISHERMEN OF CORNWALL

How the Periodic Visits of the Pilchards Support an Active Industry—The Fish, the Fishermen, and the Fishing Luggers

By EDWIN PENGELLY

Second Officer, S. S. "Minnewaska"

SINCE the closing of the tin and copper mines of Cornwall, the pilchard fishery has become the principal and most profitable industry of that beautiful and historic little Duchy.

Peculiar as it may seem, the small, dainty pilchards (*Clupea pilchardus*) seldom if ever visit any other waters along the British coast. Rarely are they sought or caught in waters eastward of Start Point, that well-known promontory on the English Channel, or in waters above Padstow in the Bristol Channel. Their rendezvous appears to be confined to the coasts and bays of the western corner of Britain. The principal places frequented by them are Whitsand Bay, Par Bay, Mounts Bay, St. Ives Bay, and the many coves along the shore.

Although for many years I was engaged in the business of pilchard fishing, and therefore was personally interested in the habits and customs of these little fellows, I never solved the reason why they regularly visit this neighborhood, or what the attractions are, yet it must be admitted that some suitable attraction must exist. It may be the nature of the sea bottom or the small bait the pilchard follows when in search of food. Like the herring, the pilchard feeds upon minute crustacea and other animals, some adult, some larval, which swarm in the sea. Whatever the attraction may be, or from whatever part the pilchards may migrate, the fact remains that they visit these coasts as regularly as do the swallows and the cuckoos, coming from the south and staying their appointed time for the benefit of the fishing folk, as it were.

The pilchard is of the same family as the sardine which abounds off the coasts of Portugal and Spain. The sardine is from five to eight inches long, while the pilchard is ten inches. In appearance it resembles the herring, but is rather thicker and its scales are larger. The under jaw of the pilchard is longer than the upper, the mouth is small and, in the adult fish, is destitute of teeth. The back is of a bluish green, the sides and belly silvery white, the tail dusky, and the gills tinged with a golden yellow.

To distinguish the pilchard from the herring is an easy matter. Hold each of them by the dorsal fin with the forefinger and thumb. The pilchard will drop by the tail, and the herring by the head.

When in deep water, pilchards swim at a depth of forty to sixty feet, yet they will approach the shore in less than six feet of water. At times they have been caught in the breakers and thrown high and dry upon the beach. They have also been caught in the pools at half tide and at low water.

The pilchards are generally sighted during the month of July from twenty to thirty miles south to southwest of the Eddystone Lighthouse. They appear in numerous shoals, and in fine weather can be seen playing on the surface, though the bulk of the shoal is at some considerable depth. These shoals are accompanied by gulls and gannets, ever watching for an opportunity to snatch any little fellows that are brave enough to show themselves above the water.

When sailing directly over a large body of pilchards, one can see myriads of tiny

bubbles rising to the surface, and the course and direction the fish are making can be ascertained beyond doubt by watching the shoals carefully, each day finding them nearer land. After the lapse of a couple of weeks or so, the fishermen, whose livelihood depends so much on the industry, can be seen preparing their nets and fitting out their boats, which are then held in readiness.

The ports of Looe, Polperro, and Mevagissey are the most important, as each has a fleet of about forty sailing smacks and motor boats engaged in the industry.

By the first week in August the pilchards arrive within easy reach of the fishing fleets, about six miles from the land. The first comers being young fish, about three years old, are rather small, and nets with meshes running thirty-four to thirty-six to the yard are used. As the season advances, older and larger fishes arrive;

then nets having thirty-two meshes to the yard are more suitable.

The sojourn of the pilchards may be divided into two distinct seasons, the summer season and the winter season. The change of seasons occurs between the months of September and November, and is as regular as the changing of the monsoon in the Indian Ocean. When the summer season sets in, large fleets of boats ply to and from the fishing grounds daily. Each day lessens the distance until a well-known saying of the fishermen becomes an accomplished fact, viz: "Corn up in shocks, pilchards in to rocks."

Whitsand Bay now becomes literally full of these fishes, and small open row boats will put out from less important ports and return in a short time heavily laden. At this period the excitement waxes great, as catches ranging from 500 to 60,000 are often taken. At times



FISHING LUGGERS LEAVING THE HARBOR OF LOOE

From several of the tiny ports of Cornwall these sturdy vessels operate. The schools of pilchards are followed and the fish are caught in gill nets

the catches are so heavy that the nets are carried to the bottom by the sheer weight of the fish, entailing great loss to the owner.

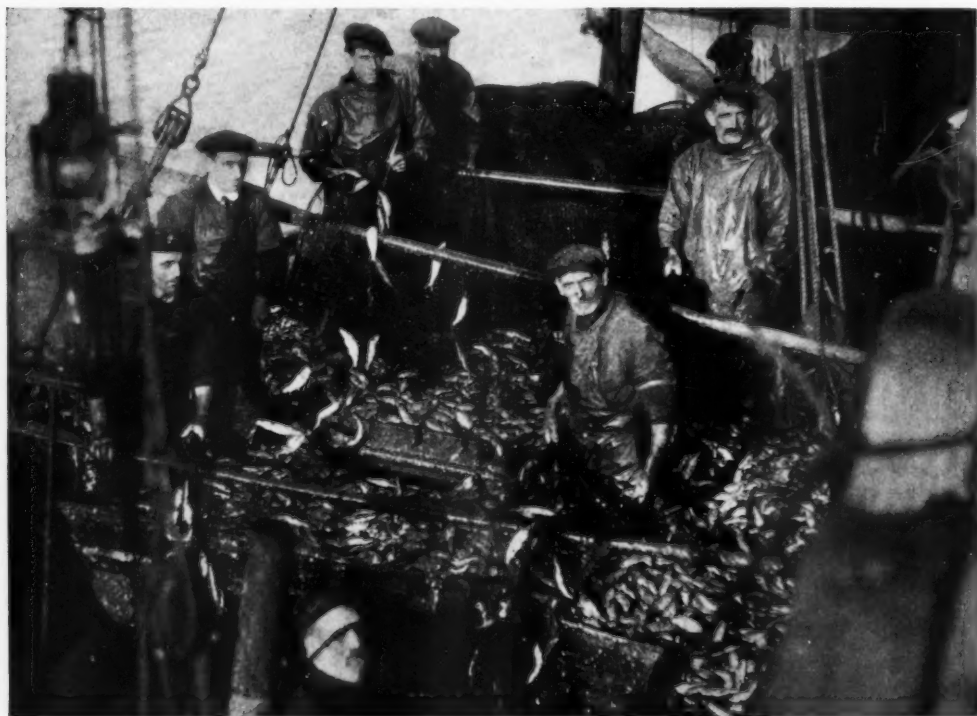
This continues in Whitsand Bay for about three or four weeks, the pilchards alternately heading toward the shore during the daytime and turning seaward an hour or so after sunset. On a calm and quiet evening the rush seaward can be heard at a great distance. The noise is almost musical, and resembles the sound of a fast-running stream tumbling over rough pebbles.

Early in September the pilchards take their final departure, and so complete is the exodus that only a few fish remain in the bay. Seldom do they change their track, the course each year being midway between Eddystone and the Rame Head. Although I have traveled across the North

and the South Atlantic Oceans many times, never have I observed any signs of shoals of pilchards. This gives me reason to believe that they remain inside the hundred-fathom line of soundings, and that their spawning ground is some fifty or sixty miles from the Cornish coast. The ova, unlike those of the herring, are quite transparent and buoyant, and they pass through their development while suspended separately in the sea water.

The fish are captured by means of drift nets and seines. The most favorable time for using the net is between dusk and dark, at the rising and the setting of the moon, and again at early dawn. Change of tide also affects them, the high and low water slacks being most favorable as the nets then lie perpendicular on the water.

Most of the pilchards landed are salted for the Mediterranean market, especially



"SHAKING OUT THE PILCHARDS"

The decks of the successful luggers are covered with thousands of pilchards while the men are engaged in landing their catch



LUGGERS IN THE HARBOR OF POLPERRO

Heavy weather is not uncommon off the coast of Cornwall, but the perfect little harbors of the fishing ports protect the fleets in periods of exceptional storm; the luggers are amply able to care for themselves at other times

for Italy and Sicily. Formerly they were cured dry, but at present the salting is carried out in large concrete pits or tanks, so that the brine formed rises over the fish and they are kept steeped in the liquid for several weeks and sometimes months. Women wash the fish and then pack them into barrels in a most unique manner, with the heads toward the center, layer upon layer. They are then placed under well-devised screw presses attached to horizontal beams. This process continues until the contents reach a required weight. The oil collected as the result of this pressure is sold principally for the use of leather dressers.

From 48,000 to 60,000 half-casks of these cured pilchards are exported annually, each containing 720 to 750 fish, according to size, and weighing from about 120 to 123 pounds gross.

The winter season begins in November of each year, the winter pilchards arriving from the south and southwest as did the

summer fish, and also accompanied by gulls and gannets.

It is not unusual for whales to follow the winter shoals. They are not welcome visitors, for occasionally they do irreparable damage to the nets.

The winter fish are older and therefore larger and firmer than the summer pilchards. They rarely enter the shoal water of the bays, but prefer to keep at a more respectful distance from the shore.

Success of the winter season depends chiefly upon weather conditions. Should fair weather prevail with north and northwest winds, the sea water become too clear. If, however, the southwesterly gales are persistent and accompanied by heavy rains, the sea water is muddied by the river freshets, and larger shoals of pilchards will approach the land, thus assuring a more profitable winter season for the fishermen.

As a rule December or early January



A PART OF THE POLPERRO FLEET PUTS TO SEA

Out past the "Peak Rocks" the little vessels sail, in order to set their nets and take their toll of the pilchard schools. Alternately setting and hauling in their nets, the fishermen work strenuously while they are at sea filling the holds of their luggers to overflowing



FISHING BOATS AT LOOE

Smaller than the fishing smacks that sail from Gloucester and the Nova Scotia Coast to the Grand Banks, these luggers are nevertheless sturdy and seaworthy, for though they do not venture far to sea in their pursuit of pilchards, they often face rough weather and boisterous seas



LOOE, AS SEEN FROM THE DOWNS

During periods of pleasant weather, when the fishing fleets are in port, the luggers are often anchored outside the little harbor. A blow, however, brings them in past the "Banjo Pier" to the protected reaches of the tiny inlet



THE INNER HARBOR AT POLPERRO

The great rise and fall of the tide in the English Channel is a definite factor in all nautical activities. In the picture some of the more distant boats can be seen to be "high and dry," which is common enough in these ports at low tide



A LADEN LUGGER ENTERING THE HARBOR OF WEST LOOE

So restricted are the fishing grounds on which the pilchards are taken that only a few of the many English Channel ports take an active interest in the business

marks the last of the pilchards; and they follow the same track as did the summer fish, apparently for the spawning ground.

The pilchard is found near shore in more or less abundance from July to January. During March and April

and into May, when as a rule none are taken near the shore, spawning pilchards are found some distance out. At this

season a few are taken occasionally in mackerel nets, in which the larger ones are meshed in consequence of their swollen condition.



A FISHERMAN OF CORNWALL

FRANK M. CHAPMAN

A Scientist Who Has Shared His Knowledge

By STEWART A. McWILLIAMS

IN recognition of his work for the promotion of Natural History Dr. Frank M. Chapman, curator of the department of ornithology in the American Museum of Natural History, in company with Charles Evans Hughes, former Secretary of State, and Charles A. Lindbergh, was presented with the Roosevelt Medal for Distinguished Service this year on October 27, the seventieth anniversary of President Roosevelt's birthday. The award was hailed by the press

and public all over the country as being highly deserved, for the career of Frank M. Chapman, scientist, writer, lecturer, editor, explorer, photographer, pioneer in modern museum exhibition, and diplomat, has been extraordinarily rich in service and value to his fellow men.

He has long been known as the man who made America conscious of its birds.

The Roosevelt Memorial Association, in announcing the award of the medal, declared that Doctor Chapman "has had more influence than any other man in America—and probably than any other man in the world—in making ornithology a popular subject which has entered into schools and homes and has become part of the education of countless numbers of men, women and children."

When he wandered about the American Museum as a boy, he found thousands of birds mounted on T perches and was obliged to search blindly to find those he had seen in real life. Later, when he joined the American Museum staff he immediately arranged a collection of the local birds found near New York City. The exhibit is still used, being changed each month as the local bird population shifts.

In an address delivered before the Inter-

national Congress of Ornithologists in London, in 1905, Doctor Chapman presented a creed which, slightly paraphrased, could well be used as the universal code for all scientists and museums:

"That science which is sufficient unto itself has no excuse for its existence. If our studies of birds have no bearing on the progress and welfare of mankind they are futile. That they have such a bearing, and in an exceptional degree, we know to be undeniable; it is obviously, therefore, the function of the Museum to demonstrate this connection in such a manner as to render apparent the bird's place in nature and its relation to man."

His creed explains many of his achievements. From it grew the dream of habitat groups—of birds mounted naturally in



FRANK M. CHAPMAN
AND THE ROOSEVELT
MEDAL



surroundings just as they are in life.

The resulting groups inaugurated a new method of museum exhibition, for, with the exception of the "Four Seasons" deer group in the Chicago Field Museum and a few less important groups in the Milwaukee Museum, all executed by Carl Akeley, they were the first attempt at the use of habitat groups on a comprehensive scale. The method, copied by museums all over America, has given new life not only to bird study but along other lines as well.

In the American Museum, Doctor Chapman has carried out his dream so well that the visitor looking at the North American bird groups is also conducted, by means of the paintings in the backgrounds, on a tour of the country.

The committee on whose recommendation the Trustees of the Roosevelt Memorial Association made the award, regard Doctor Chapman's scientific achievement as three-fold. They believe that "through his comprehensive studies of South American bird-life he has conceived and elaborated an entirely new method of ornithological research, and more than any other student has pointed out the evolutionary relationship of the forms of life inhabiting successive altitudinal zones in the Andean system."

The Andes are now known as a recent annex to the world—formed at a time for which we have a fairly definite geologic date. The many species restricted to their upper life zones have evolved since the mountains arose. Doctor Chapman was one of the first to realize the importance of studying the distribution and origin of their life.

Paying tribute to his other activities, the committee extolled Doctor Chapman's skill and charm as a lecturer and writer, and his ability as a bird photographer where he has again been a pioneer in devising some of the modern methods of the use of blinds for photography, and mechanical devices to make birds

and animals take their own pictures.

With his creed ever in mind he has written frequently and exhaustively on bird life—written so well that the thousands of copies of his books are eagerly sought both as a source of entertainment and as standards in their field. He is the founder and editor of *Bird-Lore*, now in its thirtieth year, the foremost popular bird magazine of the country and organ of the National Audubon Society.

Doctor Chapman's entire scientific career has been spent on the staff of the American Museum of Natural History. During those forty years of noteworthy service he has constantly displayed qualities as a man which have endeared him to those people with whom he has come in contact, and have made his presence a source of pleasure as well as honor to the Museum.

His rare combination of personal qualities and ability fitted him well for the difficult diplomatic task he assumed in 1918 as American Red Cross Commissioner to South America.

He is the second member of the Museum staff to receive the Roosevelt Medal in the five years the awards have been made. In 1923, Prof. Henry Fairfield Osborn, president of the Museum, was presented with the medal personally by President Harding in the White House.

Especially noteworthy among Doctor Chapman's honors are the presentation by the National Academy of Sciences, in 1918, of the first Elliot Medal, awarded annually for pre-eminence in zoölogy or palæontology, and the award of the first Linnæan Society Medal, in 1912, for general achievement in natural history.

Many have been the honors accorded him by the scientific world for his achievements, but the universal and highest tribute of all is that paid by an entire generation of people who think of him as a scientist who constantly endeavors to share his knowledge.

When the last stores have been loaded, the four ships will be directed southward toward the Bay of Whales, a bight in the Ross Sea, in longitude 160° W., latitude 78° S. This is the southernmost extension of marine waters into the ice-shrouded shores of the Antarctic continent, a land as large as either Canada, the United States, or Australia. The approach to the open stretches of the Bay of Whales will be a slow and difficult one, for a barrier of pack ice some 800 miles in width and studded with huge icebergs, lies across the route south of New Zealand. Except at the Bay of Whales, and a few other places, cliff-like walls of ice one hundred to two hundred feet high rise sheer from the icy waters along the Antarctic coast. The places where an exploring party and its equipment may be landed from ships are thus relatively few in number. Commander Byrd expects to arrive at the Bay of Whales with his ships about December 20, that is, at the beginning of summer in southern latitudes.

Much effort has been expended during the past year in organizing, financing, and equipping this large American expedition, and with four aeroplanes, various dog teams, the most modern of scientific equipment, and a well selected personnel, it is anticipated that much data of a scientific nature, chiefly geographical, will be gathered during the two years that the base camp is established on the low lying Great Ice Barrier near the Bay of Whales.

The American Museum is one of the scientific sponsors of the expedition, making available all the scientific resources of the Museum, as well as the counsel of members of its scientific staff.

With the expedition's winter quarters some 880 miles distant from the South Pole, and about 10,000 feet below it, attempts will be made by aeroplane to explore the region to the south and southeast of the base of operations.—C. A. R.

THE STOLL-McCRACKEN EXPEDITION.—On October 18 the members of the Stoll-McCracken Expedition returned to New York, arriving by train from Prince Rupert, British Columbia. The expedition schooner, the "Morrissey," will go around by way of the Panama Canal, and Capt. Robt. A. Bartlett expects to reach New York after about two months at sea.

The most important results of the expedition were the collecting of a splendid group of the Pacific walrus (males, females, and young), a group of Arctic sea birds (with Little Diomed Island as the habitat), four specimens of the so-called mummies of the Aleutian Islands (very interesting native burials which promise to disclose important data when intensively studied), several specimens

of the large Alaskan brown bear, in addition to study collections of small mammals, birds, and fish. A complete photographic record of interesting features of the work was also secured.

When the schooner broke her propeller shaft in Bering Sea, and the following three weeks were lost in the consequent repairs, it became necessary to give up the plan to reach the Kolyma River, and the itinerary as far as it pertained to Siberia was canceled. It is doubtful whether the party could have worked on the Kolyma had there been no accident to the shaft, for the ice came down into Bering Strait before the end of August and shut off all access to or from northeastern Siberia. An account of some of the most interesting features of the expedition will appear in an early number of *NATURAL HISTORY* and Mr. McCracken will lecture on "The Morrissey's Search for Arctic Mummies" in the American Museum Members Course, on December 20.

The expedition was organized by Harold McCracken, who acted as leader, and Charles H. Stoll, the financial backer of the enterprise. Mrs. Stoll accompanied her husband and took an active part in the season's work. The scientific staff was in charge of H. E. Anthony, curator of mammals in the American Museum, and included F. L. Jaques, artist and preparator, Andrew Johnstone, taxidermist, and Edward Weyer, archaeologist. Capt. Robert A. Bartlett was the skipper in command of the schooner "Effie M. Morrissey."

THE CARLISLE-CLARK AFRICAN EXPEDITION.—News from the Carlisle-Clark African Expedition indicates its complete success in obtaining exceptionally fine specimens of lions for the African Hall in the American Museum. The energies of the members were also devoted to animal photography, and Mr. Leigh, the artist, made a series of sketches of typical lion country, which will be used as studies for the background of the new group.

DR. MARGARET MEAD, assistant curator of ethnology at the American Museum, started for Australia in September, as a Fellow of the Social Service Research Council, to make a study of the mental development of young children among primitive people. She expects to visit the Bishop Museum in Honolulu, the Auckland and Wellington museums in New Zealand, and the Sydney Museum, en route. Her study base will be in some village in the Bismarck Archipelago, probably in the Admiralty Islands, where she will also collect ethnological specimens and photographs.

COVER DESIGN OF "NATURAL HISTORY"

THE SACRIFICE TO THE WAR GOD.—The cover design for this number of *NATURAL HISTORY* was painted by Mr. A. A. Jansson of the American Museum staff, and represents the elaborate ceremonial and religious life of the Aztecs. A ruler is receiving the homage of a conquered foe who later, with his comrades, will be offered up as a sacrifice to the war god. This cult was halted by the Spanish conquest in 1519, shortly after it was established. The demands for victims introduced a series of campaigns by the Aztecs in all directions from the Valley of Mexico to gather more captives to satisfy the increasing requirements of the deity.

APPRECIATIONS OF CARL AKELEY

MRS. MARY L. JOBE AKELEY, advisor and assistant in the work for the Akeley African Hall, was received with Dr. J. M. Derscheid, the Belgian zoölogist, in private audience during the evening of October tenth in the Royal Palace in Brussels by His Majesty, Albert, King of the Belgians, and by the Duke and Duchess of Brabant. At this audience, as a result of the work of the Akeley-Derscheid African Mission of 1926, plans for the organization of the Parc National Albert in the Kivu Belgian Congo were presented, and Mrs. Akeley showed the motion pictures of gorillas and the volcanoes, which Carl Akeley secured on his 1921 expedition.

Returning through London, Mrs. Akeley lectured at the Zoological Society, to the Society for the Preservation of the Fauna of the Empire, at the invitation of the president, Lord Onslow. Her lecture dealt with the findings of the Akeley-Derscheid mission in the Parc National Albert, with plans for conservation of the flora and fauna of this region, and with the possibilities for international scientific research therein.

BARON DE CARTIER PAYS TRIBUTE TO CARL AKELEY.—At the fiftieth anniversary of the activity of the Baptist Missions in the Congo region, celebrated in London, June 8, Baron de Cartier de Marchienne expressed his admiration of the devoted work of evangelical, educational, moral, and social uplift which had been carried on for many years in the Belgian Congo by the Baptist Missionary Society. He closed his speech with an appeal for conservation of Africa's natural beauties and paid the following tribute to the work of Carl Akeley:

But it is not enough to develop in every way the country, we must also prevent its natural beauties from being lost or irremediably altered.

In this way I take pride in calling your attention to the great thought of King Albert, who decided that certain parts of the Colony, particularly interesting for their flora and fauna and the natural beauty of their surroundings, should be preserved forever under the trusteeship of the Nation.

Thus was founded the Parc National Albert. It includes, as you know, the volcanic regions of Lake Kivu with its magnificent scenery, which the late Carl Akeley first revealed to the world.

Permit me to pay tribute here to the memory of Carl Akeley, the greatest naturalist and conservationist the world has ever known, and who now rests on the slopes of that mountain of Mikenko that he loved so well. You will all recall his tragic death in Kivu, where he had been sent on a special mission by that noble organization, the American Museum of Natural History of New York.

You will recall also that his widow courageously carried on his work to a most successful conclusion.

If I speak of my friends, Mr. and Mrs. Akeley, it is that I see in their case a new example of that idealism which, so to speak, flourishes naturally in all spheres of human activity in the Congo, and to which, no doubt, its religious, social, and economic development is so largely due.

AKELEY ELEPHANT SCULPTURES DESIRED FOR JOHANNESBURG.—MR. GERARD MOERDYK of Pretoria, South Africa, architect for the new railway station and the surrounding plaza at Johannesburg, recently visited the American Museum to commission Carl Akeley to design two African elephants to be cast in bronze in South Africa and placed before a sixty-foot arch at the head of the avenue approaching the new station. It was not until he was on the ship that brought him to New York that he learned of Mr. Akeley's death.

ASTRONOMY

STUDY GROUPS under the leadership of able directors are being planned by the Amateur Astronomers Association for the discussion of topics of common interest in various branches of astronomy.

HONORS

DR. FRANK M. CHAPMAN, curator-in-chief of the division of zoology and zoogeography of the American Museum, has been awarded, in company with Charles E. Hughes and Charles A. Lindbergh, the Roosevelt Medal for Distinguished Service. It was bestowed on Doctor Chapman in recognition of his remarkable work in promoting the popular study and conservation of bird-life. The presentation was made by James R. Garfield, president of the association, and the citation was given by Mr. Herman Hagedorn. Mr. Hagedorn in citing Doctor Chapman's qualification for the medal said:

For the medal for distinguished service in the promotion of the study of natural history, Mr. President, I have the honor to present a name which is beloved wherever in America, in school or home, the birds are permitted to come down from the tree tops to be the companions of men; a writer and lecturer of persuasive charm, who has taught a nation to see, to know, to love and to protect the entrancing and forever mysterious familiars of its daily life; a creative innovator in methods of exhibition and of ornithological research; a scientist, wise and unsatisfied, whose laboratory is a wilderness of Andean peaks, where fluttering wings betray to him things secret since the beginning of time.

Doctor Chapman acknowledging the presentation, said in part:

To have one's life-work stamped with approval by an organization that cherishes the ideals and is governed by the standards of Theodore Roosevelt is indeed a high reward. Only the commendation of Mr. Roosevelt himself could be higher.

I accept this medal, therefore, Mr. President, with a full understanding of the honor its brings, not alone to me and to the science I represent, but to those good citizens in feathers whose claims to our protection and friendship are yearly becoming more widely acknowledged. And certainly to no layman is Citizen Bird more deeply indebted for this recognition of his rights than to Theodore Roosevelt. It was Mr. Roosevelt's good fortune to be born a bird-lover; it was the world's good fortune that he was also born a great many other things. But the demands of many callings never crowded the bird from his heart, and in that remarkable complex of individuals who in the aggregate made Theodore Roosevelt, the naturalist always held his own.

It was his surprising ability to prevent conflict among his many absorbing interests that enabled Mr. Roosevelt to keep in touch with the literature of those branches of natural history that appealed to him, as well as to maintain contact with naturalists. Indeed, one may say that there was a natural history cabinet as well as a tennis cabinet. Most of its members lived in Washington, but when need arose, a scientist who was especially qualified to meet it might be called from elsewhere. As, for example, when Professor Osborn went to Washington for consultation on the Romanes Oxford address—"Biological Analogies in History"—which was prepared, by the way, with characteristic forehandedness a year and a half before the date set for its delivery.

This conference with a recognized authority was a characteristic habit. I have seen Mr. Roosevelt cross-examine a leading scientist on the Mendelian laws of inheritance, for example, with a series of questions that went to the very core of the problem. At such times all his mental forces were focused on the subject at issue, with an intense concentration which revealed not alone his method of acquiring, but his secret of retaining, information. Without going further, it is evident why, wholly aside from the fact that he was Theodore Roosevelt, Mr. Roosevelt exerted, and will continue to exert, a marked influence as a naturalist. In the field of ornithology this influence was most effectively shown as an appreciative, sympathetic observer and recorder, as an explorer and as a conservator. By word and deed Mr. Roosevelt taught us the value of the bird in its haunts, not alone to the student, but to the nature lover.

Above all Mr. Roosevelt emphasized the need for accuracy of statement in recording observations. The nature writer who presented fiction as fact he branded as a nature fakir so effectively that writers of this class have not yet risen to the rank of a low-type criminal!

As a hunter of big game and explorer Mr. Roosevelt included in his expeditions to Africa and South America museum men who could preserve the animals killed and also make general collections. This admirable procedure has not only become a family habit, but it has been so generally adopted by hunters and travelers that our museums actually cannot meet the demand for assistants of this kind.

But doubtless our greatest debt to Theodore Roosevelt the ornithologist, is as a conservator of bird-life.

Of the eighty Federal bird reservations now existing, fifty were established during his administration.

AMPHIBIANS, REPTILES, AND EXPERIMENTAL BIOLOGY

EXPERIMENTS WITH THE PIKE-HEADED NEWT.—

The department of herpetology and experimental biology at the American Museum has been very successful in keeping large quantities of living animals in good health. During the past summer, one of the rarest salamanders in the collection bred continuously for several months. This species, *Triturus rusconi*, popularly called pike-headed newt, is found only in the high altitudes in Sardinia, where it breeds in the mountain streams. The department has been experimenting with a series of this species for some months while studying the causation of color patterns.

Females which were kept in tanks of running water laid their eggs between and under the stones. The eggs were not attached by stalks, as in the case of all our American salamanders which breed in mountain brooks. The stalkless

egg is characteristic of lowland newts, and the fact that this Sardinian mountain newt should have retained very much the same type of egg, although breeding in mountain brooks, is evidence of its ancestry.

Europeans have several times before succeeded in making the Sardinian newt breed in captivity, but this is the first time the species has bred in America. The department's new laboratory is planned to induce many other species to breed, with a view to working out many important details of life history.

COLOR VARIATIONS IN MOUNTAIN SALAMANDERS.—

Mr. William G. Hassler spent three days in the field at Durbin, West Virginia, during October. In this short time he made a record catch of 879 salamanders, as well as various reptiles, and brought the whole series back to the Museum alive. The field work was undertaken to learn more about several color varieties of the mountain salamander, *Desmognathus fuscus carolinensis*. At Durbin the subspecies exhibits enormous variations,—individuals uniformly orange in color, yellow with zigzag cross stripes, and reddish with black longitudinal stripes being found together under one stone. The mountain salamander seems to be in the act of mutating in this region, and the large series brought to the Museum will be used in experimental investigations concerning the origin of some of these variations.

SALAMANDER EGGS FOR EXPERIMENTAL

BIOLOGY.—A shipment of 1600 living eggs of the giant salamander, *Cryptobranchus*, has just been received by the department of herpetology and experimental biology. These are to be used in a variety of studies. Amphibian eggs are ideal for determining the mechanics of development. The epoch-making discoveries of the German embryologist Spemann, on the "organizers" of development, have been perhaps the greatest contribution of recent times to the field of embryology. This work was carried on with amphibian eggs not one tenth the size of the eggs just received by the department.

Cryptobranchus breeds in the Allegheny Mountains, and the present shipment came from southwestern Pennsylvania. They were laid under rocks in the mountain streams, and as shown in an exhibit in the new Reptile Hall, the males guard the eggs until the young are hatched.

BLINDNESS IN CAVE ANIMALS.—Byron C. Marshall, who has been studying blind salamanders in the caves of Missouri and Arkansas, brought back with him a supply of several hun-

dred specimens for use in the experimental work now being carried on by Dr. G. K. Noble of the department of herpetology, to determine the causes of blindness in cave animals.

LOWER INVERTEBRATES

THE NEW ROTIFER GROUP.—A new group was formally opened to the public in the Darwin Hall of the American Museum on October 10. It is known as the Rotifer Group, and is a companion piece to the Bryozoa Group, which shows two inches of sea bottom magnified 25 diameters. The Rotifer Group, designed by Dr. Roy W. Miner and constructed under his direction, presents to the observer the microscopic life found in one half inch of pond bottom as one would see it through a microscope magnifying cubically one million times. The myriads of minute living creatures in association with plant life that crowd so small an area are shown intent on catching and devouring their prey, struggling to avoid being caught and devoured themselves, and reproducing their kind, even as the creatures of the visible world crowd their larger environment, seriously engaged in the business of living. The most conspicuous beings spinning about in this aquatic world are the rotifers or "wheel-bearers," microscopic animals with rows of vibrating cilia wreathing their heads. These are shown in all their diversifications, and the entire exhibit has been planned with a view to revealing to the uninitiated observer just what a rotifer is and does.

Most of the organisms possess a texture and coloring so translucent and delicate that glass is the only medium capable of reproducing them naturally. The remarkable glass modeling of the group is the work of Herman O. Mueller of Doctor Miner's staff of artists. The delicate coloring of the models and background was done by Mr. W. H. Southwick, while the wax reproductions were modeled by Mr. Chris E. Olsen.

The field work was largely carried on at Mt. Desert Island, Maine, by Doctor Miner in collaboration with Mr. Frank J. Myers. The field color sketches were prepared by Dr. George H. Childs under Doctor Miner's direction.

"SIMBA" WINS BRITISH APPROVAL

BRITISH PRAISE OF "SIMBA."—British appreciation of the Martin Johnson film, introduced in London under the name "Safari," has been enthusiastically voiced in the *London Times* and in the *London Spectator*.

Baron de Cartier de Marchienne also saw the film in London, and wrote President Osborn the following personal tribute:

Last night I witnessed at the Palace Theater the marvelous film taken by Mr. and Mrs. Martin Johnson and depicting wild life in British East Africa.

I just want you to know that the audience was very enthusiastic and very deservedly so, as I am positive that I was never privileged to see such a wonderful cinematographic production as "Simba."

NEW PUBLICATIONS

Trails of the Hunted. By James L. Clark, pp. 310. Illustrated with photographs. Little, Brown, and Company, Boston, 1928.

To be charged by buffalo, rhinos, lions, and elephants, is experience—to live through many charges and to write observingly and modestly of these, is accomplishment. Mr. Clark's semi-biographical volume is rich in the thrill of close association with big game, game so often dangerous to the hunter. The trails have led through three great continents, and each has yielded great game. Africa has furnished the finest material for this book. No one could put down the volume while reading of the breathless night when Clark and Dugmore crawled out of their thorny *boma* to replace the flashlight charge exploded just before by a lion at the kill, or when stampeding elephants charged back and forth in search of the man who had climbed as high as he could in a small thorn tree in their midst.

Having gone to East Africa while its vast herds of game were still magnificent in their proportions, before the modern slaughter was too well under way, the author had opportunity that no one now may have. Since then he has gone twice again. Always with the eye of an artist and a taxidermist who must observe enough to reconstruct later that which he has seen, his memory has not failed him in this accounting. African hunting books are many. Few compare with Clark's.

America might seem an unexciting place to hunt. Yet the author considers our giant Alaskan bear the most powerful of all carnivores and one at least as dangerous as the lion. Nor are there animals more difficult to hunt than our mountain goats and sheep. American game is not neglected.

With W. J. Morden, the writer hunted the greatest of all sheep, the *Ovis poli* of the high Pamirs. On this trip across central Asia the hunters became captives of the Mongols. After several days of torture they escaped with their lives, but with memories of an experience that cannot help but enrich a life of high adventure.

Opportunity came to Mr. Clark and he made the most of it. His book is ample testimony.

—R. T. HATT.

A Re-Study of some of the Ordovician and Silurian Cephalopods described by Hall. By August F. Foerste, Denison University Bull. Vol. XXIII, (1928)

NEW VERSUS OLD CEPHALOPOD SPECIES— Within the last few years many new species of

cephalopods have been described from such regions as Greenland, Manchuria, Yunnan, and Burma. Many of these new species either do not fit into the zoological classification in vogue, or when they are included, the classification no longer serves its purpose. In either case new genera, new families, and new classes must be erected, for the study of this new material has cleared up obscure points in the anatomy of this group. It has also added enormously to our knowledge of the oldest representatives of this very important class of invertebrates.

Unfortunately this increasingly fine classification of new material has not always been extended to old species. As matters stand at present, our knowledge could be greatly increased by the re-study of the collections made by the earlier geologists. These old collections, for the most part, remain classified according to obsolete standards and are consequently inadequately catalogued.

In recent years Dr. August F. Foerste of Dayton, Ohio, has made a re-study of American Silurian and Ordovician cephalopods. From time to time he has issued short papers proposing new views and theories for the criticism of his scientific colleagues, and described more completely and accurately older species. The latest of these papers is devoted to the re-description and re-classification of a part of the James Hall collection of cephalopods in the American Museum. Forty-one species are described, of which seven are recognized as new. Two new genera have also been erected. The greater number of these species had not been re-studied since 1861, some as early as 1847. During the summer of 1928, Doctor Foerste studied similar collections in the museums of Petrograd.

Laboratory research of this sort lacks the excitement attending the exploration of new areas, but it is as important to the advancement of science, and far less expensive. Moreover, there are many other species of fossil invertebrates in the older collections of the American Museum whose re-study would be of special interest to science.—C. A. R., and J. W. M.

CONSERVATION

A FORWARD STEP IN WILD LIFE CONSERVATION. A meeting of great importance with respect to the fortunes of wild life in our country was held in Seattle, Washington, August 27–31, 1928. This was the annual Convention of the International Association of Game, Fish and Conservation Commissioners, which was held jointly with the Western Association of State Game Commissioners and the American Fisheries Society. Among the many questions up for discussion none

was of greater interest than that of what stand the Conservation organizations of the United States should take in reference to the two Game Refuge Bills pending in the lower House of Congress.

So great was the importance attached to this subject that an extended hearing was given, as a result of which Dr. T. Gilbert Pearson, as chairman of the Resolutions Committee, submitted the following resolution, which was unanimously adopted:

"WHEREAS, in our opinion there exists a great and urgent need for the establishment and maintenance of a number of inviolate sanctuaries for the protection of migratory wild fowl and shore-birds; and

"WHEREAS, we believe it to be the duty of the Federal Government, in carrying out its treaty obligations, to make provision for the creation of such reservation areas; and

"WHEREAS, we believe that reservations of this character should be acquired and financed by congressional appropriations; therefore be it

"RESOLVED, That the International Association of Game, Fish, and Conservation Commissioners, and the Western Association of State Game Commissioners representing the official state game departments in twenty-eight states which are here present and voting, do hereby jointly endorse in principle the provisions of the Norbeck Bill as approved by the United States Senate in May, 1928; and be it further

"RESOLVED, That to carry out the wishes of this joint convention in the matters recited above and to represent them and other organizations interested in wild bird and animal protection, and for the purpose of representing these several organizations in other congressional efforts that may be undertaken, looking for the further protection of our wild mammals and birds, there be and there is here created the "National Committee on Wild Life Legislation" consisting of eleven members to be selected as follows:

"One to be appointed by each of the following organizations: International Association of Game, Fish, and Conservation Commissioners; Western Association of State Game Commissioners; The American Forestry Association; American Game Protective Association; Isaac Walton League of America; and the National Association of Audubon Societies; and that this Committee so created shall have power to add to its number five additional members selected at large throughout the United States."

EIDER DUCKS BREEDING IN MAINE.—Contrary to the general belief, eider ducks do not breed exclusively in arctic and sub-arctic regions. Some years ago a breeding colony of them was discovered on the coast of Maine by an agent of the National Association of Audubon Societies. The Association at once employed a warden to guard the birds against the raids of local fishermen, who were reported to have a decided taste for their eggs. This protection has been continued every summer, with the result that the eider ducks are now holding their own as a breeding species within the borders of the United States.

SUMATRAN ORANG-UTAN THREATENED WITH EXTINCTION.—The preservation of the gorilla is assured in Africa, thanks to the work of Carl Akeley, through the establishment of the gorilla sanctuary in the Parc National Albert. The orang-utan, another of the great apes, is sorely in need of similar protection, for it is threatened with rapid extinction in Sumatra, particularly because it is more restricted in its distribution.

The demand from zoölogical gardens for living specimens is steady and lucrative, because the animals do not long survive captivity, and since the natives have found a way of catching the orang-tans alive, they are being exported in large numbers. Only drastic measures restricting the capture and export of the orang-utans can avert their rapid extermination. To this end the Society for the Preservation of the Fauna of the Empire is hoping to get the Dutch government to adopt such restrictive legislation.

MEETINGS OF SOCIETIES

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.—The New York Meeting of the American Association for the Advancement of Science and Associated Societies will be held December 27, 1928, to January 2, 1929, inclusive, with the American Museum as headquarters. President Henry Fairfield Osborn, Honorary Chairman Michael J. Pupin, and Secretary Sam F. Trelease are coöperating with the

Washington office and the secretaries of sections and societies to make the meetings an outstanding scientific event, with a special program for Sunday, December 30. On the morning of this day excursions are planned for those interested in the several well-known scientific institutions in New York and its vicinity. In the afternoon the Association and its associated societies are to be the guests of an anonymous friend at a gift concert of the Philharmonic-Symphony Society. The evening will be devoted to attending the reception given to the scientists by the trustees of the Metropolitan Museum of Art.

The evening addresses and some of the afternoon addresses have been carefully selected by President Osborn for their general interest to scientists and laymen alike, and will be held each day in the large auditorium at the American Museum. Following each address there will be a reception especially to students and workers in the field covered by the address, with visits to the pertinent exhibition halls.

CONTRIBUTORS TO THIS ISSUE

ALFRED M. BAILEY, director of the Chicago Academy of Sciences, has always enjoyed bird photography as a hobby. In this connection he has worked in Canada, the Hawaiian Islands, the Bahamas, and most of the United States. For three years he was a representative of the Biological Survey in Alaska, and only recently returned from the Field Museum Abyssinian Expedition. The bird life of our West has always interested him, and in his "Feathered Water Babies of the Prairies" he tells of some of the vicissitudes of a bird photographer's life.

ALBERT E. BUTLER, preparator at the American Museum, accompanied by Clarence Rosenkranz, artist, was sent early in 1928 to India, Burma, British East Africa, and Angola, to collect accessories and make color sketches for the backgrounds of several mammal groups, the animals for which had been collected by Mr. Arthur S. Vernay and Col. J. C. Faunthorpe. Mr. Butler describes some of his experiences in "The Jungle-land of Burma."

MISS FRIDA DAVIDSON has been actively associated for many years with the Hudson Guild Settlement, that center of all good things to the children of the crowded Chelsea district of New York City. She has long been a leader also in the Sunday School of the New York Society for Ethical Culture. In both fields of activity she has been able to combine happily her appreciation of children on the one hand and of story and drama on the other. The children of the Sunday

School have, under her direction, frequently portrayed re-interpretations of the Christmas stories in playlets or other programs, the sources of which are presented in her article "How Our Christmas Customs Came," in this issue of *NATURAL HISTORY*.

WILLIAM D. MATTHEW, Ph.D., author of "The Ape-Man of Java," may be said to be a born palæontologist and geologist, partly because his father, the late Dr. G. F. Matthew, was one of the most eminent of Canadian geologists. From boyhood William accompanied his father on his geological rambles around his native city of St. John, N.B. Doctor Matthew's earlier papers were on mineralogy and geology, and it was not until after he had taken his doctorate at Columbia under the geologist Kemp, that he came to the American Museum at the invitation of President Osborn and began to devote himself to vertebrate palæontology. Doctor Matthew has to his credit a long series of technical papers and monographs dealing chiefly with fossil mammals and with the mammalian faunas of the Western States, which have brought him many high honors, including an active membership in the Royal Society of Great Britain. His *Climate and Evolution* is the most famous of his less technical writings.

EDWIN PENGELLY, who tells us about "Fish and Fishermen of Cornwall" is well qualified to write about this industry since his family were formerly owners of a fishing fleet at Cornwall,

and Mr. Pengelly was engaged in the pilchard fisheries for about five or six years. He is now second officer on the S.S. "Minnewaska" of the Atlantic Transport Line.

HERBERT P. WHITLOCK, C.E., the author of "What Is a Gem?" has been curator of minerals and gems at the American Museum since 1914, and specializes in mathematical crystallography. His principal work is on calcite, in which connection he has published a Memoir entitled *Calcites of New York*, and a *Critical Discussion of Forms of Calcite*, as well as several Museum Bulletins on special occurrences of calcites.

CHESTER A. REEDS, Ph.D., who writes about "Storms and Storm Tracks" in this number of NATURAL HISTORY, lived as a boy on the prairies of Central Oklahoma, where he witnessed many a tornado, and often, with his brothers, was forced to seek refuge in the storm cellar of his home. Doctor Reeds is curator of geology and invertebrate palaeontology, and observer in charge of the seismograph at the American Museum. He is a frequent contributor to NATURAL HISTORY MAGAZINE.

GEORGE C. VAILLANT, Ph.D., author of the first article in this issue of NATURAL HISTORY, received his archaeological training at Harvard University, giving special attention to Mexico and Central America, where he carried on field studies for Harvard, Peabody Museum at Andover, Carnegie Institution, and the Boston Museum of Fine Arts. In 1927 he was appointed assistant curator of Mexican archaeology at the American Museum.

MARGARET MEAD, Ph.D., assistant curator of ethnology of the Pacific Islands at the American Museum, is now on her way to Australia as Fellow of the Social Service Research Council, where she is expecting to make field studies among Melanesians. She is the author of "*Coming of Age in Samoa*," a work based on her studies of Samoan girls and women during 1925-26 when the National Research Council granted her a fellowship for this purpose. Her article "Children in Samoa," in this issue of NATURAL HISTORY is based on her first-hand study of the subject.

NEW MEMBERS

SINCE the last issue of NATURAL HISTORY the following persons have been elected members of the American Museum, making the total number 10,635.

Associate Founder

Dr. W. L. HILDBURGH.

Life Members

Mrs. EDGAR PALMER.

Miss MARY SEPTON THOMAS.

Messrs. JAMES B. MUNN, SHELDON M. SMITH.

Master BYRON S. MILLER.

Annual Members

Messdames THOS. ADAMS, JABEZ BURNS, HARWARD W. CRAM, JAMES BRECKENRIDGE CURTIS, LYMAN TIFFANY DYER, FRANCIS DE LACY HYDE, GEORGE LEGG, THOMAS A. MASON, PAUL MAUSOLFF, W. H. NICHOLS, JOHN NICKERSON, D. CHESTER NOYES, EDWIN G. SEIBELS, R. SIEDENBURG, J. EMMET TOWER.

Sister M. ADELAIDE.

Misses MARY C. ALLERTON, HELEN M. FOGG, GRACE HASTINGS, KATHRYN LOUISE HUBER, ALICE LARKIN, LUCILE W. MURCHISON, PATRICIA O'CONNOR, FRANCES S. REILLY.

Doctors IRVIN H. BEACH, LEOPOLD BRAHDY, EVERETT COLGATE JESSUP, A. E. NEERGAARD, HERMAN SCHMELZ.

Messrs. GEORGE H. BLAKELEY, RALPH COOK, JOHN DURANT GEORGE J. DYER, O. P. FLOWER, WM. ALBERT HARRISON, ALFRED S. HART, EDWARD HEIM, JOHN VANCE HEWITT, WM. H. HILLEGAS, SHERMAN REESE HOYT, WM. ANGAMAR LARNER, THEO. E. LYON, TRACY LYON, JAMES MASON, A. J. MEIER, ARNOLD M. MITTENTHAL, JAMES NESMITH, 2d., FRANCIS T. NICHOLS, FRANKLIN WHEELER PALMER, CLARENCE C. SCHIMMEL, CHAS. E. STEELE, RUBIN STRICKMAN, JOSEPH UNGER.

Masters GEORGE HERMAN, FRANCIS LYNN, GEORGE J. STRICKER.

Associate Members

Countess JULIA OF DAR"REY.

Messdames GEORGE D. BRIGGS, ALICE O. CORNISH, GEO. D. MCCREARY, JR., E. H. MORTER, HORTENSE J. O'NEIL, W. Y. PETERS, C. M. THURNAUER, O. G. WOOD.

Misses L. S. BENNETT, GLADYS BONDURANT, B. M. BUTLER, ALICE G. CHANDLER, JOSEPHINE C. CLEMMER, ADDIE M. FRENCH, DOROTHY E. HACK, RACHAEL C. HALL, VIOLET D. HOLGERSEN, PATTY MUNROE, LEILA OWEN, NELL PHIPPS, LILLIAN E. SMITH, MARJORIE F. STAIGER, HARRIET C. WATERMAN, HARRIET C. WESTERVELT, LORETTO DES. WILKINSON.

Reverends E. M. BOWMAN, E. W. GOULD, JOSEPH C. SINCLAIR, J. SPENCER.

Doctors E. LEE DORSETT, HARRY FLANSBURG, CARL E. GUTHE, J. I. HAMAKER, JOHN C. HEMMETER, P. REISS, FRITZ SÄBERSKY, F. SEBRING SLIFER, P. M. SMITH, O. L. TINKLEPAUGH, L. C. WILLS, J. R. WILSON.

Sir THOS. TAIT.

Messrs. LOUIS J. ALBER, HENRY AMAMA, J. AMOZURRUTIA, C. A. BATES, BEN S. BEERY, WILLIAM M. BLADE, LEVERETT BRADLEY, HENRY J. BREMERS, JR., CHARLES K. BROWN, JR., LAURENCE BUTLER, JR., SAMUEL ALEXANDER CALDWELL, R. CARLEY, ALBERT CHERNEY, HENRY P. COOLIDGE, CHAS. W. CULLEN, EVERETT ELDRIDGE, HARRY ELDRIDGE, JOHN EVANS J. H. FLEMING, PAUL L. GINTER, HAROLD S. GLADWIN, ALLAN GRAHAM, OWEN GUDGER, CHARLES H. GUILBERT, JR., AUGUST E. HANSON, HARRY V. HARLAN, JOHN J. HEARD, HENRY P. HEDIGER, W. C. HENDERSON, HERMAN W. HILL, JORDAN DUBOIS, HILL, ARNOLD W. HUNNEWELL, GEORGE KEAGY, ADOLPH KIESLER, ROSS LAWLER, R. A. LINTON, CHARLES I. LONG, AUBREY H. MACANDREWS, GEO. D. MCCREARY, JR., S. J. MCGREW, EDGAR G. MILLER, JR., G. FREAN MORCOM, PAUL S. MOYER, N. O. NELSON, D. B. OLMSTEAD, H. H. ORR, JOHN A. OUSKA, FRANK N. PARCHER, HENRY IVISON PARSONS, ARTHUR E. PATTISON, M. L. PETERSON, THOMAS C. POTTS, MARK W. REEVES, JAMES SEYMOUR RICKLEFS, PHILLIPS RUSSELL, RICHARD W. SCHUMMEHL, MORRIS F. SKINNER, CHARD POWERS SMITH, JOHN SMITH, ROGER P. SMITH, RALPH C. STAEBNER, JOSEPH B. STEVENS, JAMES G. STICKLEATHER, J. FRANK STIMSON, WILLIAM F. SWIFT, JR., CHARLES L. THOMPSON, J. A. H. TORRY, RICHARD M. TYLER, HUGO VALENTINER, D. VAN KRUGTEN, JOS. S. WADE, F. KING WAINWRIGHT, EDWARD R. WARREN, STAFFORD M. WHEELER, STANLEY H. WISSLER, STEPHEN STOCKTON WOOLSTON, W. JENKS WOOLSTON, WILLIAM PAUL WREDEN, F. O. WULFIN.

Masters EDWARD R. HOWE, DONALD ROSS.

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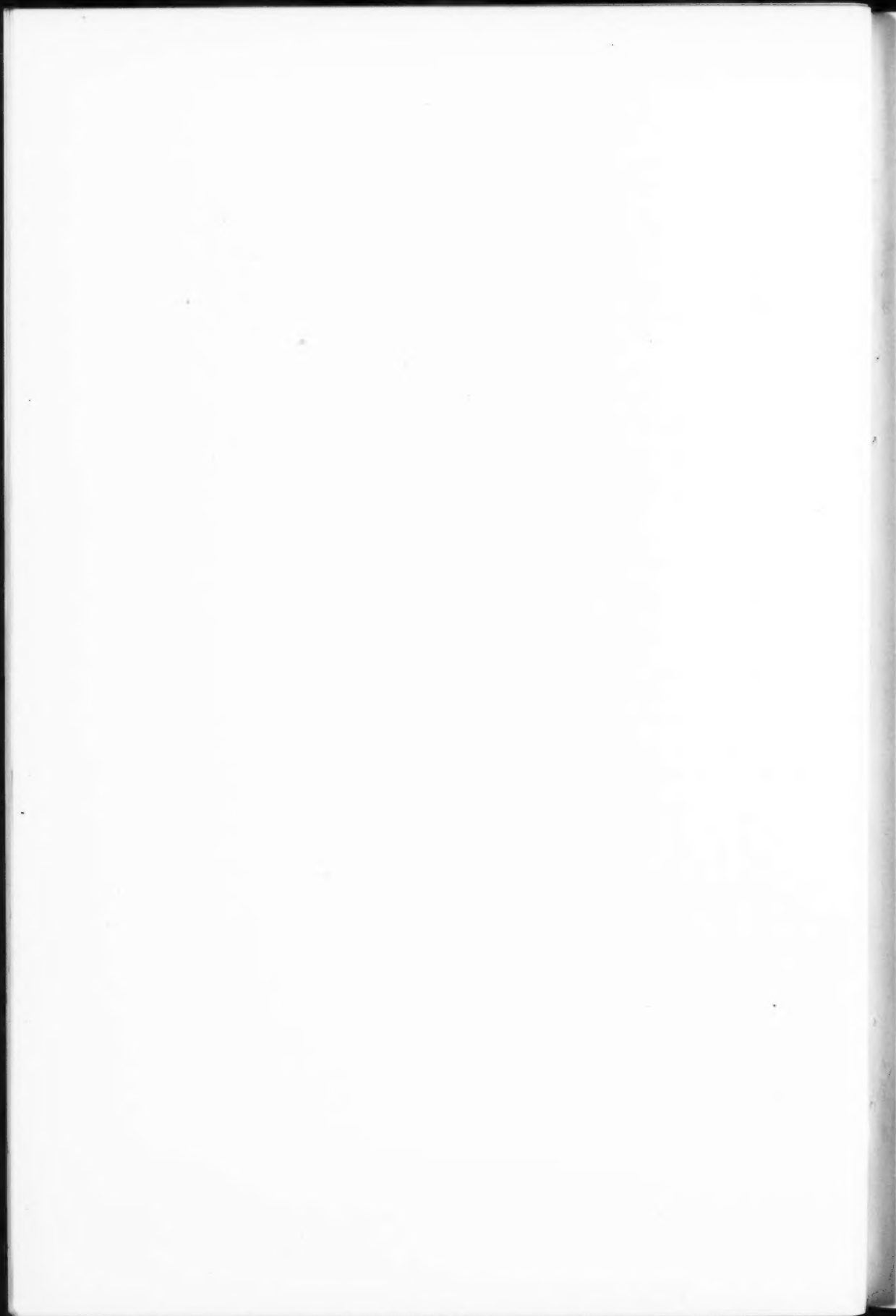
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